Great Neck Public Schools

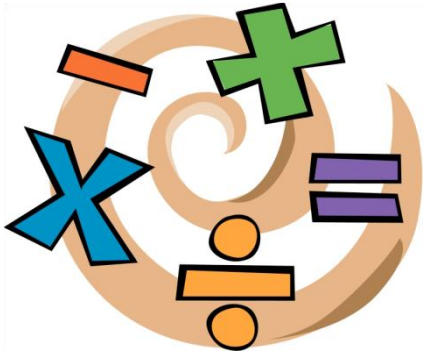
Mathematics Curriculum

Pre-Kindergarten – Grade 5

Common Core Learning Standards for Mathematics

and

Pacing Guide



September 2011

Mathematics Curriculum Guide

Pre-Kindergarten through Grade 5

Great Neck Public Schools

September 2011

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Mathematics Curriculum Guide (Pre-K-5)
Great Neck Public Schools
September 2011

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Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1. Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent

representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4. Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8. Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Middle School Content: By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x^2 + x + 1), and (x – 1)(x^3 + x2 + x + 1) might lead them to the general formula for the sum of a geometric series

Mathematics - Pre-Kindergarten: Introduction

In Pre-Kindergarten, instructional time should focus on two critical areas: (1) developing an understanding of whole numbers using concrete materials, including concepts of correspondence, counting, cardinality, and comparison; (2) describing shapes in their environment. More learning time in Pre-Kindergarten should be devoted to developing the concept of number than to other topics.

(1) Students develop an understanding of the meanings of whole numbers and recognize the number of objects in small groups by counting – the first and most basic mathematical algorithm. They understand that number words refer to quantity. They use one-to-one correspondence to solve problems by matching sets and comparing number amounts and in counting objects to 10. They understand that the last word that they state in counting tells "how many" and they count to determine number amounts and compare quantities (using language such as "more than" and "less than").

(2) Students describe their physical world using geometric ideas (e.g., shape and special relations) and vocabulary. They identify and name basic two-dimensional shapes, such as triangles, rectangles, squares, and circles. They use basic shapes and spatial reasoning to model objects in their environment.

Grade PK Overview

Counting and Cardinality
- Know number names and the count sequence.
- Count to tell the number of objects.
- Compare numbers.

Operations and Algebraic Thinking
- Understand addition as adding to, and understand subtraction as taking from.

Understand simple patterns.

Measurement and Data
- Describe and compare measurable attributes.
- Sort objects and count the number of objects in each categories.

Geometry
- Identify and describe shapes (squares, circles, triangles, rectangles).
- Analyze, compare, and sort objects.

Great Neck Public Schools
Mathematics – Pre-Kindergarten Common Core Learning Standards

Counting & Cardinality **PK.CC**	**Example**
Know number names and the count sequence. • Count to 20. (PK.CC.1) • Represent a number of objects with a written numeral 0–5 (with 0 representing a count of no objects). (PK.CC.2) **Count to tell the number of objects. Understand the relationship between numbers and quantities to 10; connect counting to cardinality.** (PK.CC.3) • When counting objects, say the number names in the standard order, using one and only one number name for each object (one-to-one correspondence). (PK.CC.3a) • Understand that the last number name said tells the number of objects counted. (PK.CC.3b) • The number of objects is the same regardless of their arrangement or the order in which they were counted. (PK.CC.3b) • Understand that each successive number name refers to a quantity that is one larger. (PK.CC.3c) • Answer *"How many?"* questions about as many as 10 things arranged in a line, a rectangular array, or a circle, or as many as 5 things in a scattered configuration. (PK.CC.4) • Given a number from 1–10, count out that many objects. (PK.CC.4)	

Compare numbers.	
• Identify whether the number of objects in one group is more, less, greater than, fewer, and/or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 5 objects). (PK.CC.5) • Identify "first" and "last" related to order or position. (PK.CC.6)	

Counting and Cardinality Vocabulary		
count count up count down different equal fewer first	greater than higher last less than match more	next number number names (1 – 20) one more order pair same

Operations & Algebraic Thinking PK.OA	Example
Understand addition as adding to, and understand subtraction as taking from. • Demonstrate an understanding of addition and subtraction by using objects, fingers, and responding to practical situations. (PK.OA.1) **Understand simple patterns.** • Duplicate and extend (e.g., What comes next?) simple patterns using concrete objects. (PK.OA.2)	If we have 3 apples and add two more, how many apples do we have altogether?

Operations and Algebraic Thinking Vocabulary		
color equal fewer how many	how many left in all left more	pattern repeat same size

Measurement and Data PK.MD	Example
Describe and compare measurable attributes. • Identify measurable attributes of objects, such as length, and weight. Describe them using correct vocabulary. (PK.MD.1) **Sort objects and count the number of objects in each category.** • Sort objects into categories; count the numbers of objects in each category (limit category counts to be less than or equal to 10). (PK.MD.2)	small, big, short, tall, empty, full, heavy, and light sort by shape, color, size

Measurement and Data Vocabulary		
alike as long as as tall as big bigger biggest different heavy heavier large	larger largest length light lighter long longer longest measure scale	short shorter shortest small smaller smallest tall taller tallest weight

Geometry	**PK.G**
Identify and describe shapes (squares, circles, triangles, rectangles). • Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as top, bottom, up, down, in front of, behind, over, under, and next to. (PK.G.1) • Correctly name shapes regardless of size. (PK.G.2) **Analyze, compare, and sort objects.** • Analyze, compare, and sort two- and three-dimensional shapes and objects, in different sizes, using informal language to describe their similarities, differences, and other attributes (e.g., color, size, and shape). (PK.G.3) • Create and build shapes from components (e.g., sticks and clay balls). (PK.G.4)	

Geometry Vocabulary		
behind	in front of	shape
beside	next to	sides
bottom	off	size
circles	on	square
color	out	top
corners	over	triangle
down	rectangle	under
in	round	up

Pre-Kindergarten Pacing Guide	September	Resources
Geometry PK.G **Identify and describe shapes (squares, circles, triangles, rectangles).** • Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as top, bottom, up, down, in front of, behind, over, under, and next to. (PK.G.1) • Correctly name shapes regardless of size. (PK.G.2)		***Literature*** *The Shape of Things* by Dayle Ann Dodds *Color Zoo* by Lois Ehlert *Alphabet City* by Steven T. Johnson *Circle Dogs* by Kevin Henkes *Sea Shapes* by Macdonald *Shapes, Shapes, Shapes* by Hoban *When a Line Bends…A Shape Begins* by Greene ***Materials*** Attribute Shapes Attribute Blocks Geoboards Three Dimensional Solid Figures Counters ***Online Resources*** Pre-k Harcourt Math Pre-k Shape Activities Shape Crafts Shape Activities and Crafts SMART Board Lessons

Pre-Kindergarten Pacing Guide	October	Resources
Geometry PK.G (cont'd) **Identify and describe shapes (squares, circles, triangles, rectangles).** • Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as top, bottom, up, down, in front of, behind, over, under, and next to. (PK.G.1) • Correctly name shapes regardless of size. (PK.G.2) **Analyze, compare, and sort objects.** • Analyze, compare, and sort two- and three-dimensional shapes and objects, in different sizes, using informal language to describe their similarities, differences, and other attributes (e.g., color, size, and shape). (PK.G.3) • Create and build shapes from components (e.g., sticks and clay balls). (PK.G.4)		

Pre-Kindergarten Pacing Guide	November	Resources
Geometry PK.G (cont'd) **Analyze, compare, and sort objects.** • Analyze, compare, and sort two- and three-dimensional shapes and objects, in different sizes, using informal language to describe their similarities, differences, and other attributes (e.g., color, size, and shape). (PK.G.3) • Create and build shapes from components (e.g., sticks and clay balls). (PK.G.4) **Measurement and Data PK.MDM** **Sort objects and count the number of objects in each category.** • Sort objects into categories; count the numbers of objects in each category (limit category counts to be less than or equal to 10). (PK.MD.2)		***Literature*** *Sorting* by Lynn Peppas *Sorting* by Henry Arthur Pluckrose *Let's Sort* by David Bauer *Play and Learn: Turn the Wheel Shapes and Sorting: Easy Learning Fun, For the Very Young* by Roger Priddy ***Materials*** Unifix Cubes Attribute Links Attribute Buttons Sorting Trays Sorting Mats Sorting Hoops ***Online Resources*** Pre-k Harcourt Math Pattern Prints Pattern Activities Pattern Templates SMART Board Lessons

Pre-Kindergarten Pacing Guide	December	Resources
Operations & Algebraic Thinking PK.OA **Understand simple patterns.** • Duplicate and extend (e.g., What comes next?) simple patterns using concrete objects. (PK.OA.2)		***Literature*** *Elmer* by David McKee *Pingo the Plaid Panda* by Loreen Leedy *Pattern Bugs* by Trudy Harris *Pattern Fish* by Trudy Harris *Beep Beep, Vroom Vroom* by Stuart Murphy ***Materials*** Pattern Mats Pattern Strips Counters Unifix Cubes Stamps Stringing Beads Lakeshore Pattern Boxes ***Online Resources*** Pre-k Harcourt Math SMART Board Lessons

Pre-Kindergarten Pacing Guide	January	Resources
Operations & Algebraic Thinking PK.OA (cont'd) **Understand simple patterns.** • Duplicate and extend (e.g., What comes next?) simple patterns using concrete objects. (PK.OA.2) **Counting & Cardinality PK.CC** **Know number names and the count sequence.** • Count to 20. (PK.CC.1) • Represent a number of objects with a written numeral 0–5 (with 0 representing a count of no objects). (PK.CC.2) **Count to tell the number of objects. Understand the relationship between numbers and quantities to 10; connect counting to cardinality.** (PK.CC.3) • When counting objects, say the number names in the standard order, using one and only one number name for each object (one-to-one correspondence). (PK.CC.3a) • Understand that the last number name said tells the number of objects counted. (PK.CC.3b) • The number of objects is the same regardless of their arrangement or the order in which they were counted. (PK.CC.3b) • Understand that each successive number name refers to a quantity that is one larger. (PK.CC.3c) • Answer *"How many?"* questions about as many as 10 things arranged in a line, a rectangular array, or a circle, or as many as 5 things in a scattered configuration. (PK.CC.4)		***Literature*** *Counting Crocodiles* by Judy Sierra *Count!* Denise Fleming *The Crayon Counting Book* by Pam Munoz Ryan and Jerry Pallotta *Chicka Chicka 1,2,3* by Bill Martin, Jr. and Michael Sampson *Ten Apples Up on Top* by Dr. Seuss *Let's Count* by Hoban *Mouse Count* by Walsh ***Materials*** Counters Unifix Cubes Links Lakeshore Activities Magnetic Numbers Calendar Number Line Dominoes Number Puzzles Handwriting without Tears Workbook ***Online Resources*** Number and Counting Activities Pre-k Harcourt Math Number Games Number Recognition More Math Activities

Pre-Kindergarten Pacing Guide **January continued**

- Given a number from 1–10, count out that many objects. (PK.CC.4)

Compare numbers.

- Identify whether the number of objects in one group is more, less, greater than, fewer, and/or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 5 objects). (PK.CC.5)

- Identify "first" and "last" related to order or position. (PK.CC.6)

Pre-Kindergarten Pacing Guide	February	Resources
Counting & Cardinality PK.CC (cont'd) **Count to tell the number of objects. Understand the relationship between numbers and quantities to 10; connect counting to cardinality.** (PK.CC.3) • When counting objects, say the number names in the standard order, using one and only one number name for each object (one-to-one correspondence). (PK.CC.3a) • Understand that the last number name said tells the number of objects counted. (PK.CC.3b) • The number of objects is the same regardless of their arrangement or the order in which they were counted. (PK.CC.3b) • Understand that each successive number name refers to a quantity that is one larger. (PK.CC.3c) • Answer *"How many?"* questions about as many as 10 things arranged in a line, a rectangular array, or a circle, or as many as 5 things in a scattered configuration. (PK.CC.4) • Given a number from 1–10, count out that many objects. (PK.CC.4)		

Pre-Kindergarten Pacing Guide	March	Resources
Count to tell the number of objects. Understand the relationship between numbers and quantities to 10; connect counting to cardinality. (PK.CC.3) • When counting objects, say the number names in the standard order, using one and only one number name for each object (one-to-one correspondence). (PK.CC.3a) • Understand that the last number name said tells the number of objects counted. (PK.CC.3b) • The number of objects is the same regardless of their arrangement or the order in which they were counted. (PK.CC.3b) • Understand that each successive number name refers to a quantity that is one larger. (PK.CC.3c) • Answer *"How many?"* questions about as many as 10 things arranged in a line, a rectangular array, or a circle, or as many as 5 things in a scattered configuration. (PK.CC.4) • Given a number from 1–10, count out that many objects. (PK.CC.4) **Compare numbers.** • Identify whether the number of objects in one group is more, less, greater than, fewer, and/or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 5 objects). (PK.CC.5) • Identify "first" and "last" related to order or position. (PK.CC.6)		

Pre-Kindergarten Pacing Guide	April	Resources
Measurement and Data PK.MD **Describe and compare measurable attributes.** • Identify measurable attributes of objects, such as length, and weight. Describe them using correct vocabulary. (PK.MD.1)		***Literature*** *Inch by Inch* by Leo Lionni *Fattest, Tallest, Biggest, Snowman Ever* by Bettina *Best Bug Parade* by Stuart Murphy *The Enormous Carrot* by Vladmir Vasilevich Vagin *Pardon Said the Giraffe* by Colin West ***Materials*** Unifix Cubes Building Blocks Classroom Objects Yarn or String Links ***Online Resources*** Pre-k Harcourt Math SMART Board Lessons

Pre-Kindergarten Pacing Guide	May	Resources
Measurement and Data PK.MD (cont'd) **Describe and compare measurable attributes.** • Identify measurable attributes of objects, such as length, and weight. Describe them using correct vocabulary. (PK.MD.1) **Operations & Algebraic Thinking PK.OA** **Understand addition as adding to, and understand subtraction as taking from.** • Demonstrate an understanding of addition and subtraction by using objects, fingers, and responding to practical situations. (PK.OA.1)		\

Pre-Kindergarten Pacing Guide	June	Resources
Operations & Algebraic Thinking PK.OA (cont'd) **Understand addition as adding to, and understand subtraction as taking from.** • Demonstrate an understanding of addition and subtraction by using objects, fingers, and responding to practical situations. (PK.OA.1)		***Literature*** *M&M Addition Book* by Barbara Barbieri McGrath *M&M Subtraction Book* by Barbara Barbieri McGrath *Mission Addition* by Loreen Leedy ***Materials*** Counters Unifix Cubes Number Cards ***Online Resources*** Harcourt Math SMART Board Lessons Addition Activities Math Book List

Mathematics – Kindergarten: Introduction

In Kindergarten, instructional time should focus on two critical areas: (1) representing and comparing whole numbers, initially with sets of objects; (2) describing shapes and space. More learning time in Kindergarten should be devoted to number than to other topics.

1. Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations such as 5 + 2 = 7 and 7 – 2 = 5. (Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required.) Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.

2. Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary. They identify, name, and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles, and hexagons, presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes such as cubes, cones, cylinders, and spheres. They use basic shapes and spatial reasoning to model objects in their environment and to construct more complex shapes.

Grade K Overview

Counting and Cardinality
- Know number names and the count sequence.
- Count to tell the number of objects.
- Compare numbers.

Operations and Algebraic Thinking
- Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Number and Operations in Base Ten
- Work with numbers 11–19 to gain foundations for place value.

Measurement and Data
- Describe and compare measurable attributes.
- Classify objects and count the number of objects in categories.

Geometry
- Identify and describe shapes.
- Analyze, compare, create, and compose shapes.

Mathematics – Kindergarten Common Core Learning Standards

Counting and Cardinality **K.CC**	**Example**
Know number names and the count sequence. • Count to 100 by ones and by tens. (K.CC.1) • Count forward beginning from a given number within the known sequence (instead of having to begin at 1). (K.CC.2) • Write numbers from 0 to 20. (K.CC.3) • Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). (K.CC.3)	
Count to tell the number of objects. Understand the relationship between numbers and quantities; connect counting to cardinality. (K.CC.4) • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (1:1 correspondence). (K.CC.4a) • Understand that the last number name said tells the number of objects counted. (K.CC.4b) • The number of objects is the same regardless of their arrangement or the order in which they were counted. (K.CC.4b) • Understand that each successive number name refers to a quantity that is one larger. (K.CC.4c)	
Develop understanding of ordinal numbers (1^{st} – 10^{th}) to describe the relative position and magnitude of whole numbers. • Count to answer "*How many?"* questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration. (K.CC.5) • Given a number from 1–20, count out that many objects. (K.CC.5)	count up, count on, up 1, 1 more, 1 higher, count forward 1
Compare numbers. • Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 10 objects). (K.CC.6) • Compare two numbers between 1 and 10 presented as written numerals. (K.CC.7)	more, fewer, less, same

Counting & Cardinality Vocabulary		
1 higher 1 more array compare count count forward 1 count on count sequence, 1-100 count up	digit equal to fewer greater than how many less less than match more number names, 1-100	numbers numeral ordinal numbers, 1^{st}-10^{th} pair quantity same sequence skip counting by 10's up 1

Operations & Algebraic Thinking K.OA	Example
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from. • Represent addition and subtraction with objects, fingers, mental images, drawings (drawings need not show details), sounds (e.g.,claps), acting out situations, verbal explanations, expressions, or equations. (K.OA.1) • Solve addition and subtraction word problems using number facts up to 10, e.g., by using objects or drawings to represent the problem. (K.OA.2) • Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (Fact Families up to 10). (K.OA.3) • For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. (K.OA.4) • Fluently add and subtract within 5. (K.OA.5)	4-1=3 How can we show 5 using two numbers?

Operations & Algebraic Thinking Vocabulary		
addend	equal to	putting together
adding to	equation	subtraction
addition	expression	sum
all together	how many fewer	take away
compose	how many more	taking apart
decompose	in all	taking from
difference	minus	total

Numbers & Operations in Base Ten **K.NBT**	**Example**
Work with numbers 11-19 to gain foundations for place value. • Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation. (K.NBT.1) • Understand that numbers from 11-19 are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones. (K.NBT.1)	18 = 10 + 8, 10 + 8 = 18 base ten blocks

Numbers & Operations in Base Ten Vocabulary		
break apart ones	place value put together	tens

Measurement and Data K.MD	Example
Describe and compare measurable attributes. • Describe several measurable attributes of a single object (size, weight, capacity). (K.MD.1) • Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference (size, weight, capacity). (K.MD.2) **Classify objects and count the number of objects in each category.** • Classify objects into given categories. (K.MD.3) • Sort objects into categories and count and compare quantities. (Limit category counts to be less than or equal to 10). (K.MD.3)	long, short, tall, light, heavy, big, full, empty longer, shorter, taller, lighter, heavier, more, less, least, most, same, different Compare the heights of two children and describe one child as taller/shorter. shape, color, size, etc.; Venn diagrams; same and different; use attribute blocks order numbers least to greatest

Measurement & Data Vocabulary		
attribute	heavy	more
big	heavier	more of
category	height	most
classify	length	object
compare	least	same
data	less	short
describe	less of	shorter
difference	light	small
different	lighter	sort
empty	long	tall
full	longer	taller
greatest	measure	weight

Geometry **K.G**	**Example**
Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres). • Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to. (K.G.1) • Correctly name shapes regardless of their orientations or overall size. (K.G.2) • Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). (K.G.3)	inside, outside, left, middle, right, top, bottom
Analyze, compare, create, and compose shapes. • Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length). (K.G.4) • Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes. (K.G.5) • Compose simple shapes to form larger shapes. (K.G.6)	Which of these is a triangle? Select all the squares. Can you join these two triangles with full sides touching to make a rectangle?

Geometry Vocabulary		
above	equal	rectangle
alike	face	right
analyze	flat	same different
behind	hexagon	shape
below	in front of	shape
beside	inside	sides
between	join	similar
bottom	last	size
by	left	solid
circle	length	sphere
compare	line	square
compose	middle	three-dimensional
cone	next to	top
corners	orientation	triangle
create	outside	two-dimensional
cube	position	vertices
cylinder		

Notes for Kindergarten Pacing Calendar

The following is a suggested pacing guide. Please take into consideration individual students' needs. It is recommended that the Common Core Standards be introduced according to the calendar below. However, each standard should also be incorporated into mathematical instruction throughout the year. Please refer to Pre-K 2010 Common Core State Standards to review material covered prior to Kindergarten, understanding not every child attends Pre-K.

Kindergarten students are expected to count to 100 by the end of the year. Therefore, we have added 10 digits each month cumulatively over the year. In addition, parts of each standard are crossed out if they are not to be covered at that time, but appear again later when appropriate to cover.

Any PreK through 1st Grade textbook series would be helpful as a teacher resource, sources for remedial drill and practice and/or enrichment, as well as homework assignments. Mathematical concepts also can be taught using a variety of computer software and/or programs, or using a SMART Board; you do not need to use a specific program or game. Of course, at this early childhood stage of development, math concepts should be incorporated throughout daily instruction. (for example, Morning Meeting, Calendar, etc.) Below is a small sample of suggested materials, literature, software and online resources to support implementation of the new Kindergarten Common Core Math Standards.

Kindergarten Pacing Guide	September	Resources	
Know number names and the count sequence. {0-9} • Count to 100 by ones ~~and by tens.~~ (K.CC.1) **{0-9}** • Write numbers from 0 ~~to 20.~~ (K.CC.3) **{0-9}** • Represent a number of objects with a written numeral 0-~~20~~ (with 0 representing a count of no objects). (K.CC.3) **{0-9}** **Count to tell the number of objects. Understand the relationship between numbers and quantities; connect counting to cardinality.** (K.CC.4) • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (1:1 correspondence). (K.CC.4a) **{0-9}**		***Literature*** *10 Little Mice* by J. Dunbar *Anno's Counting Book* by M. Anno *Dinner at the Panda Palace* by S. Calmenson *Ten Apples Up on Top* by Dr. Seuss *10 Black Dots* by Donald Crews *One Was Johnny: A Counting Book* by Maurice Sendak *Counting Crocodiles* by Judy Sierra *More Than One*bby Schlein *Mouse Count* by Ellen Stoll Walsh *Let's Count* by Tana Hoban *Somewhere in the Ocean* by Ward *Chicka, Chicka, 1,2,3* by Bill Martin, Jr. *One, Two, Skip a Few* by Anderson ***SMARTBoard Resources*** SMARTBoard Lessons ***Software*** KidPix, Pixie	***Materials*** Counters Two-Color Counters Unifix Cubes Ten Frames Number Cards Dominoes Handwriting Resources (*Fundations, Handwriting without Tears,* etc.) Dice Wiki Sticks Lakeshore (or other company) games and boxed centers Number Line Adding Machine Paper Tape rolls Hundreds Chart Magnetic Numbers ***Teacher Resources*** *Counting Ourselves and Others* (TERC) *Math Their Way* ***Online Resources*** K-5 Math Resources Math Literature More Math Literature

Kindergarten Pacing Guide	October	Resources
Know number names and the count sequence. {0-20} • Count to 100 by ones ~~and by tens.~~ (K.CC.1) **{0-20}** • Write numbers from 0 to 20. (K.CC.3) **{0-20}** • Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). (K.CC.3) **{0-20}** • Count forward beginning from a given number within the known sequence (instead of having to begin at 1). (K.CC.2) **{0-20}** **Count to tell the number of objects. Understand the relationship between numbers and quantities; connect counting to cardinality.** (K.CC.4) • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (1:1 correspondence). (K.CC.4a) **{0-20}** • Understand that the last number name said tells the number of objects counted. (K.CC.4b) **{0-20}** • The number of objects is the same regardless of their arrangement or the order in which they were counted. (K.CC.4b) **{0-20}** • Understand that each successive number name refers to a quantity that is one larger. (K.CC.4c) **{0-20}** • Given a number from 1–20, count out that many objects. (K.CC.5)		See September Resources

Kindergarten Pacing Guide	November	Resources
Know number names and the count sequence. {0-30} • Count to 100 by ones and by tens. (K.CC.1) **{0-30}** • Write numbers from 0 to 20. (K.CC.3) **{0-30}** • Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). (K.CC.3) **{0-30}** • Count forward beginning from a given number within the known sequence (instead of having to begin at 1). (K.CC.2) **{0-30}** **Count to tell the number of objects. Understand the relationship between numbers and quantities; connect counting to cardinality.** (K.CC.4) • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (1:1 correspondence). (K.CC.4a) **{0-30}** • Understand that the last number name said tells the number of objects counted.(K.CC.4b) **{0-30}** • The number of objects is the same regardless of their arrangement or the order in which they were counted. (K.CC.4b) **{0-30}** • Understand that each successive number name refers to a quantity that is one larger. (K.CC.4c) **{0-30}** **Compare numbers.** • Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 10 objects). (K.CC.6) • Compare two numbers between 1 and 10 presented as written numerals. (K.CC.7) • Given a number from 1–20, count out that many objects. (K.CC.5)		See September Resources ***Additional Materials*** Sorting trays Various counters ***Additional Literature*** *One…Two…Three…Sassafras!* by Murphy *How Many Blue Birds Flew Away?* by Giganti

Kindergarten Pacing Guide	December	Resources
Know number names and the count sequence. {0-40} • Count to 100 by ones and by tens. (K.CC.1) **{0-40}** • Write numbers from 0 to 20. (K.CC.3) **{0-40}** • Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). (K.CC.3) **{0-40}** • Count forward beginning from a given number within the known sequence (instead of having to begin at 1). (K.CC.2) **{0-40}** **Count to tell the number of objects. Understand the relationship between numbers and quantities; connect counting to cardinality.** (K.CC.4) • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (1:1 correspondence). (K.CC.4a) **{0-40}** • Understand that the last number name said tells the number of objects counted. (K.CC.4b) **{0-40}** • The number of objects is the same regardless of their arrangement or the order in which they were counted. (K.CC.4b) **{0-40}** • Understand that each successive number name refers to a quantity that is one larger. (K.CC.4c) **{0-40}** **Compare numbers.** • Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 10 objects). (K.CC.6) • Compare two numbers between 1 and 10 presented as written numerals. (K.CC.7) • Given a number from 1–20, count out that many objects. (K.CC.5) **Work with numbers 11-19 to gain foundations for place value.** • Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation. (K.NBT.1) • Understand that numbers from 11-19 are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones. (K.NBT.1)		See September Resources ***Additional Materials*** Base Ten Blocks Place Value Pocket Chart Straws

Kindergarten Pacing Guide	January	Resources
Know number names and the count sequence. {0-50} • Count to 100 by ones and by tens. (K.CC.1) **{0-50}** • Write numbers from 0 to 20. (K.CC.3) **{0-50}** • Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). (K.CC.3) **{0-50}** • Count forward beginning from a given number within the known sequence (instead of having to begin at 1). (K.CC.2) **{0-50}** **Count to tell the number of objects. Understand the relationship between numbers and quantities; connect counting to cardinality.** (K.CC.4) • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (1:1 correspondence). (K.CC.4a) **{0-50}** • Understand that the last number name said tells the number of objects counted. (K.CC.4b) **{0-50}** • The number of objects is the same regardless of their arrangement or the order in which they were counted. (K.CC.4b) **{0-50}** • Understand that each successive number name refers to a quantity that is one larger. (K.CC.4c) **{0-50}** **Compare numbers.** • Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 10 objects). (K.CC.6) • Compare two numbers between 1 and 10 presented as written numerals. (K.CC.7) **Develop understanding of ordinal numbers (1^{st} – 10^{th}) to describe the relative position and magnitude of whole numbers.** • Count to answer "*How many?"* questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration. (K.CC.5) • Given a number from 1–20, count out that many objects. (K.CC.5)		See September Resources ***Additional Literature*** *Jelly Beans for Sale* by McMillan *Leaping Lizards* by Murphy *The Mitten* by Jan Brett *10 Little Rubber Ducks* by Eric Carle *Henry the Fourth* by Stuart Murphy ***Teacher Resources*** *How Many in All? (*TERC)

Kindergarten Pacing Guide January (Continued)

Work with numbers 11-19 to gain foundations for place value.

- Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation. (K.NBT.1)
- Understand that numbers from 11-19 are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones. (K.NBT.1)

Understand addition as putting together and adding to, ~~and understand subtraction as taking apart and taking from.~~

- Represent addition ~~and subtraction~~ with objects, fingers, mental images, drawings (drawings need not show details), sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. (K.OA.1)
- For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. (K.OA.4)
- Fluently add ~~and subtract~~ within 5. (K.OA.5)

Kindergarten Pacing Guide	February	Resources
Know number names and the count sequence. {0-60} • Count to 100 by ones and by tens. (K.CC.1) **{0-60}** • Write numbers from 0 to 20. (K.CC.3) **{0-60}** • Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). (K.CC.3) **{0-60}** • Count forward beginning from a given number within the known sequence (instead of having to begin at 1). (K.CC.2) **{0-60}** **Count to tell the number of objects. Understand the relationship between numbers and quantities; connect counting to cardinality.** (K.CC.4) • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (1:1 correspondence). (K.CC.4a) **{0-60}** • Understand that the last number name said tells the number of objects counted. (K.CC.4b) **{0-60}** • The number of objects is the same regardless of their arrangement or the order in which they were counted. (K.CC.4b) **{0-60}** • Understand that each successive number name refers to a quantity that is one larger. (K.CC.4c) **{0-60}** **Compare numbers.** • Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 10 objects). (K.CC.6) • Compare two numbers between 1 and 10 presented as written numerals. (K.CC.7)		See September Resources ***100th Day of School*** Activities & Literature ***Additional Literature*** *One Less Fish* by K. Toft

Kindergarten Pacing Guide February (Continued)

Develop understanding of ordinal numbers (1^{st} – 10^{th}) to describe the relative position and magnitude of whole numbers.

- Count to answer "*How many?"* questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration. (K.CC.5)
- Given a number from 1–20, count out that many objects. (K.CC.5)

Work with numbers 11-19 to gain foundations for place value.

- Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation. (K.NBT.1)
- Understand that numbers from 11-19 are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones. (K.NBT.1)

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

- Represent addition and subtraction with objects, fingers, mental images, drawings (drawings need not show details), sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. (K.OA.1)
- Solve addition and subtraction word problems using number facts up to 10, e.g., by using objects or drawings to represent the problem. (K.OA.2)
- Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (Fact Families up to 10). (K.OA.3)
- For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. (K.OA.4)
- Fluently add and subtract within 5. (K.OA.5)

Kindergarten Pacing Guide	March	Resources
Know number names and the count sequence. {0-70} • Count to 100 by ones and by tens. (K.CC.1) **{0-70}** • Write numbers from 0 to 20. (K.CC.3) **{0-70}** • Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). (K.CC.3) **{0-70}** • Count forward beginning from a given number within the known sequence (instead of having to begin at 1). (K.CC.2) **{0-70}** **Count to tell the number of objects. Understand the relationship between numbers and quantities; connect counting to cardinality.** (K.CC.4) • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (1:1 correspondence). (K.CC.4a) **{0-70}** • Understand that the last number name said tells the number of objects counted. (K.CC.4b) **{0-70}** • The number of objects is the same regardless of their arrangement or the order in which they were counted. (K.CC.4b) **{0-70}** • Understand that each successive number name refers to a quantity that is one larger. (K.CC.4c) **{0-70}** **Compare numbers.** • Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 10 objects). (K.CC.6) • Compare two numbers between 1 and 10 presented as written numerals. (K.CC.7) **Develop understanding of ordinal numbers (1^{st} – 10^{th}) to describe the relative position and magnitude of whole numbers.** • Count to answer "*How many?"* questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration. (K.CC.5)		***Literature*** *When a Line Bends…A Shape Begins* by Greene *Sea Shapes* by MacDonald *So Many Circles, So Many Squares* by Tana Hoban *Shapes, Shapes, Shapes* by Tana Hoban *Shape Space* by Falwell *The Shape of Things* by Lois Ehlert *Cubes, Cones, Cylinders & Spheres* by Tana Hoban *Mouse Shapes* by Ellen Stohl Walsh *There's a Square* by Mary Serfozo *Shape Capers* by Cathryn Falell ***Additional Materials*** Attribute Blocks Pattern Blocks Geoboards and Rubber Bands Buttons, Beans, Various Objects Solid Figures ***Teacher Resources*** *Making Shapes and Building Blocks (TERC)*

Kindergarten Pacing Guide March (Continued)

- Given a number from 1–20, count out that many objects. (K.CC.5)

Work with numbers 11-19 to gain foundations for place value.

- Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation. (K.NBT.1)
- Understand that numbers from 11-19 are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones. (K.NBT.1)

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

- Represent addition and subtraction with objects, fingers, mental images, drawings (drawings need not show details), sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. (K.OA.1)
- Solve addition and subtraction word problems using number facts up to 10, e.g., by using objects or drawings to represent the problem. (K.OA.2)
- Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (Fact Families up to 10). (K.OA.3)
- For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. (K.OA.4)
- Fluently add and subtract within 5. (K.OA.5)

Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

- Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to. (K.G.1)
- Correctly name shapes regardless of their orientations or overall size. (K.G.2)
- Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”). (K.G.3)

Kindergarten Pacing Guide	April	Resources
Know number names and the count sequence. {0-80} • Count to 100 by ones and by tens. (K.CC.1) **{0-80}** • Write numbers from 0 to 20. (K.CC.3) **{0-80}** • Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). (K.CC.3) **{0-80}** • Count forward beginning from a given number within the known sequence (instead of having to begin at 1). (K.CC.2) **{0-80}** **Count to tell the number of objects. Understand the relationship between numbers and quantities; connect counting to cardinality.** (K.CC.4) • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (1:1 correspondence). (K.CC.4a) **{0-80}** • Understand that the last number name said tells the number of objects counted. (K.CC.4b) **{0-80}** • The number of objects is the same regardless of their arrangement or the order in which they were counted. (K.CC.4b) **{0-80}** • Understand that each successive number name refers to a quantity that is one larger. (K.CC.4c) **{0-80}** **Compare numbers.** • Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 10 objects). (K.CC.6) • Compare two numbers between 1 and 10 presented as written numerals. (K.CC.7) **Develop understanding of ordinal numbers (1^{st} – 10^{th}) to describe the relative position and magnitude of whole numbers.**		***Additional Materials*** Sticks Clay Balls

Kindergarten Pacing Guide April (Continued)

- Count to answer "*How many?"* questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration. (K.CC.5)
- Given a number from 1–20, count out that many objects. (K.CC.5)

Work with numbers 11-19 to gain foundations for place value.

- Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation. (K.NBT.1)
- Understand that numbers from 11-19 are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones. (K.NBT.1)

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

- Represent addition and subtraction with objects, fingers, mental images, drawings (drawings need not show details), sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. (K.OA.1)
- Solve addition and subtraction word problems using number facts up to 10, e.g., by using objects or drawings to represent the problem. (K.OA.2)
- Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (Fact Families up to 10). (K.OA.3)
- For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. (K.OA.4)
- Fluently add and subtract within 5. (K.OA.5)

Kindergarten Pacing Guide April (Continued)	
Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres). • Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to. (K.G.1) • Correctly name shapes regardless of their orientations or overall size. (K.G.2) • Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). (K.G.3) **Analyze, compare, create, and compose shapes.** • Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length). (K.G.4) • Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes. (K.G.5) • Compose simple shapes to form larger shapes. (K.G.6)	

Kindergarten Pacing Guide	May	Resources
Know number names and the count sequence. {0-90} • Count to 100 by ones and by tens. (K.CC.1) **{0-90}** • Write numbers from 0 to 20. (K.CC.3) **{0-90}** • Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). (K.CC.3) **{0-90}** • Count forward beginning from a given number within the known sequence (instead of having to begin at 1). (K.CC.2) **{0-90}** **Count to tell the number of objects. Understand the relationship between numbers and quantities; connect counting to cardinality.** (K.CC.4) • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (1:1 correspondence). (K.CC.4a) **{0-90}** • Understand that the last number name said tells the number of objects counted. (K.CC.4b) **{0-90}** • The number of objects is the same regardless of their arrangement or the order in which they were counted. (K.CC.4b) **{0-90}** • Understand that each successive number name refers to a quantity that is one larger. (K.CC.4c) **{0-90}** **Compare numbers.** • Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 10 objects). (K.CC.6) • Compare two numbers between 1 and 10 presented as written numerals. (K.CC.7)		***Additional Literature*** *How Tall, How Short, How Far Away?* by David Adler *The Greatest Gymnast of All* by Murphy *How Heavy Is It?* by Sargent *The Best Bug Parade* by Murphy *House for Birdie* by Murphy *Tops and Bottom* by J. Stevens *Rosie's Walk* by P. Hutchins *The Berenstain Bears: Inside, Outside, Upside Down* by Stan Berenstain *The Lot at the End of My Block* by K. Lewis

Kindergarten Pacing Guide May (Continued)

Develop understanding of ordinal numbers (1^{st} – 10^{th}) to describe the relative position and magnitude of whole numbers.

- Count to answer "*How many?"* questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration. (K.CC.5)
- Given a number from 1–20, count out that many objects. (K.CC.5)

Work with numbers 11-19 to gain foundations for place value.

- Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation. (K.NBT.1)
- Understand that numbers from 11-19 are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones. (K.NBT.1)

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

- Represent addition and subtraction with objects, fingers, mental images, drawings (drawings need not show details), sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. (K.OA.1)
- Solve addition and subtraction word problems using number facts up to 10, e.g., by using objects or drawings to represent the problem. (K.OA.2)
- Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (Fact Families up to 10). (K.OA.3)
- For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. (K.OA.4)
- Fluently add and subtract within 5. (K.OA.5)

Kindergarten Pacing Guide May (Continued)

Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

- Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to. (K.G.1)
- Correctly name shapes regardless of their orientations or overall size. (K.G.2)
- Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). (K.G.3)

Analyze, compare, create, and compose shapes.

- Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length). (K.G.4)
- Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes. (K.G.5)
- Compose simple shapes to form larger shapes. (K.G.6)

Describe and compare measurable attributes.

- Describe several measurable attributes of a single object (size, weight, capacity). (K.MD.1)
- Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference (size, weight, capacity). (K.MD.2)

Kindergarten Pacing Guide	June	Resources
Know number names and the count sequence. {0-100} • Count to 100 by ones and by tens. (K.CC.1) **{0-100}** • Write numbers from 0 to 20. (K.CC.3) **{0-100}** • Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). (K.CC.3) **{0-100}** • Count forward beginning from a given number within the known sequence (instead of having to begin at 1). (K.CC.2) **{0-100}** **Count to tell the number of objects. Understand the relationship between numbers and quantities; connect counting to cardinality.** (K.CC.4) • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (1:1 correspondence). (K.CC.4a) **{0-100}** • Understand that the last number name said tells the number of objects counted. (K.CC.4b) **{0-100}** • The number of objects is the same regardless of their arrangement or the order in which they were counted. (K.CC.4b) **{0-100}** • Understand that each successive number name refers to a quantity that is one larger. (K.CC.4c) **{0-100}** **Compare numbers.** • Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies (include only groups with up to 10 objects). (K.CC.6) • Compare two numbers between 1 and 10 presented as written numerals. (K.CC.7) **Develop understanding of ordinal numbers (1^{st} – 10^{th}) to describe the relative position and magnitude of whole numbers.** • Count to answer "*How many?"* questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration. (K.CC.5) • Given a number from 1–20, count out that many objects. (K.CC.5)		See Above **<u>Additional Literature:</u>** *Sorting at the Ocean* by Roy *More M&M's Brand Chocolate Candies Math* by McGrath *The Button Box* by M. Reid *Sorting* by H. Pluckrose

Kindergarten Pacing Guide June (Continued)

Work with numbers 11-19 to gain foundations for place value.

- Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation. (K.NBT.1)
- Understand that numbers from 11-19 are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones. (K.NBT.1

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

- Represent addition and subtraction with objects, fingers, mental images, drawings (drawings need not show details), sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. (K.OA.1)
- Solve addition and subtraction word problems using number facts up to 10, e.g., by using objects or drawings to represent the problem. (K.OA.2)
- Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (Fact Families up to 10). (K.OA.3)
- For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. (K.OA.4)
- Fluently add and subtract within 5. (K.OA.5)

Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

- Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to. (K.G.1)
- Correctly name shapes regardless of their orientations or overall size. (K.G.2)
- Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). (K.G.3)

Kindergarten Pacing Guide June (Continued)

Analyze, compare, create, and compose shapes.

- Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length). (K.G.4)
- Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes. (K.G.5)
- Compose simple shapes to form larger shapes. (K.G.6)

Describe and compare measurable attributes.

- Describe several measurable attributes of a single object (size, weight, capacity). (K.MD.1)
- Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference (size, weight, capacity). (K.MD.2)

Classify objects and count the number of objects in each category.

- Classify objects into given categories. (K.MD.3)
- Sort objects into categories and count and compare quantities. (Limit category counts to be less than or equal to 10). (K.MD.3)

Mathematics - Grade 1: Introduction

In Grade 1, instructional time should focus on four critical areas: (1) developing understanding of addition, subtraction, and strategies for addition and subtraction within 20; (2) developing understanding of whole number relationships and place value, including grouping in tens and ones; (3) developing understanding of linear measurement and measuring lengths as iterating length units; and (4) reasoning about attributes of, and composing and decomposing geometric shapes.

1. Students develop strategies for adding and subtracting whole numbers based on their prior work with small numbers. They use a variety of models, including discrete objects and length-based models (e.g., cubes connected to form lengths), to model add-to, take-from, put-together, take-apart, and compare situations to develop meaning for the operations of addition and subtraction, and to develop strategies to solve arithmetic problems with these operations. Students understand connections between counting and addition and subtraction (e.g., adding two is the same as counting on two). They use properties of addition to add whole numbers and to create and use increasingly sophisticated strategies based on these properties (e.g., "making tens") to solve addition and subtraction problems within 20. By comparing a variety of solution strategies, children build their understanding of the relationship between addition and subtraction.

2. Students develop, discuss, and use efficient, accurate, and generalizable methods to add within 100 and subtract multiples of 10. They compare whole numbers (at least to 100) to develop understanding of and solve problems involving their relative sizes. They think of whole numbers between 10 and 100 in terms of tens and ones (especially recognizing the numbers 11 to 19 as composed of a ten and some ones). Through activities that build number sense, they understand the order of the counting numbers and their relative magnitudes.

3. Students develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating (the mental activity of building up the length of an object with equal-sized units) and the transitivity principle for indirect measurement.[1]

4. Students compose and decompose plane or solid figures (e.g., put two triangles together to make a quadrilateral) and build understanding of part-whole relationships as well as the properties of the original and composite shapes. As they combine shapes, they recognize them from different perspectives and orientations, describe their geometric attributes, and determine how they are alike and different, to develop the background for measurement and for initial understandings of properties such as congruence and symmetry.

Grade 1 Overview

Operations and Algebraic Thinking

- Represent and solve problems involving addition and subtraction.
- Understand and apply properties of operations and the relationship between addition and subtraction.
- Add and subtract within 20.
- Work with addition and subtraction equations.

Number and Operations in Base Ten

- Extend the counting sequence.
- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

Measurement and Data

- Measure lengths indirectly and by iterating length units.
- Tell and write time.
- Represent and interpret data.

Geometry

- Reason with shapes and their attributes.

Mathematics – First Grade Common Core Learning Standards

Operations & Algebraic Thinking 1.OA	**Example**

Represent and solve problems involving addition and subtraction.
• Use addition and subtraction within 20 to solve word problems by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. (1.0A.1)
  • adding to
  • taking from
  • putting together
  • taking apart
  • comparing
  • solving with unknowns in all positions
 	
See Table 1 in Glossary for examples.
	Adding To:
	3 birds fly to a tree. 2 more birds come. How many in all?
	Taking From:
	10 apples are in a tree. I picked 4 of them. How many are left?
	Putting Together:
	I have 2 blue marbles and 3 purple marbles. How many in all?
	Taking Apart:
	There are 8 balls. 3 of the balls are footballs. The rest are soccer balls. How many are soccer balls?
	Comparing:
	There are 5 bees. There are 2 flowers. How many fewer flowers?
	Solving with unknowns with all positions:
	Fill in the missing number:
	? - 5 = 0 2 + ? = 10 9 – 5 = ?

• Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20 Examples: by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. (1.OA.2)	Jessica lives on a farm with lots of animals. They have 3 chickens, 3 goats, and 2 sheep. How many animals are there on the farm?
Understand and apply properties of operations and the relationship between addition and subtraction.	

• Apply properties of operations as strategies to add and subtract. (1.OA.3) *Students need not use formal terms for these properties.*	**Commutative property of addition**: If 8 + 3 = 11 is known, then 3 + 8 =11 is also known. **Associative property of addition:** To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12.
• Understand subtraction as an unknown-addend problem. (1.OA.4)	Subtract 10 – 8 by finding the number that makes 10 when added to 8. (8+2=10)
Add and subtract within 20. •Relate counting to addition and subtraction. Example: skip-counting, number patterns, counting forward and backwards **(1.OA.5)**	**Skip-counting:** By counting on 2 to add 2. 6+2 = ? (think "2,4,6,8")
•Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. **(1.OA.6)** • Use strategies such as: • counting on • making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14) • decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9) • using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4) • creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).	
Work with addition and subtraction equations. • . Understand the meaning of the equal sign (equal sign means the **same value** on both sides) • Determine if equations involving addition and subtraction are true or false. **(1.OA.7)**	Which of the following equations are **true** and which are **false**? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2

• Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. **(1.OA.8)**	Determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = ? – 3, 6 + 6 = ?

Operations & Algebraic Thinking Vocabulary		
Add	Equation	Plus sign
Addend	Equivalent	Putting together
Addition	False	Skip count
Addition sentence	Greater	Subtract
Commutative property	Greatest	Subtraction sentence
Compare	Making ten	Sum
Compose	Minus sign	Taking apart
Count back	More than	Taking from
Count on	Number line	True
Decompose	Number sentence	Two-digit number
Difference	One-digit number	Unknown
Equal to	Operation	

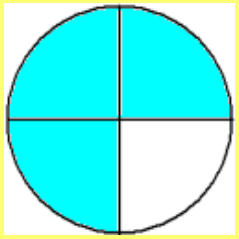
Numbers and Operations in Base Ten **1.NBT**	**Example**
Extend the counting sequence. • Count to 120, starting at any number less than 120. • Read and write numerals. • Represent a number of objects with a written numeral. **(1.NBT.1)**	Start at 79. Continue counting to 85.
Understand place value. • Understand that the two digits of a two-digit number represent amounts of tens and ones. **(1.NBT.2)**	
Understand the following as special cases: • 10 can be thought of as a bundle of ten ones — called a "ten." • The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. • The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).	14 = <u>1 ten</u> and <u>4 ones</u> 60 = <u>6 tens</u> and <u>0 ones</u>
• Compare two two-digit numbers (based on meanings of the tens and ones digits), recording the results of comparisons with the symbols >, =, and <. **(1.NBT.3)**	35 > 15 19 < 23 25=25
Use place value understanding and properties of operations to add and subtract. • Add within 100 including: • adding a two-digit number and a one-digit number (51 + 2) • adding a two-digit number and a multiple of 10 (26 + 30) • using concrete models or drawings and strategies based on place value • properties of operations, and/or the relationship between addition and subtraction • relate the strategy to a written method and explain the reasoning used	Use base 10 blocks **Fact Family** 5+2=7 2+5=7 7-2=5 7-5=2 **Draw, Write, and Solve** to explain your math thinking.

Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. **(1.NBT.4)** • Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. **(1.NBT.5)** • Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 by: (positive or zero differences). • using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction • relating the strategy to a written method and explain the reasoning used. (**1.NBT.6)**	Use a hundreds chart. 40-10, 60-60

Number & Operations in Base Ten Vocabulary		
Cardinal numbers	Less than	Place value
Compose	Mentally	Properties
Count	Multiples of	Sequence
Equal to	One- digit	Tens
Greater than	Ones	Tens place
	Ones place	Two-digit

Measurement & Data 1.MD	Example
Measure lengths indirectly and by iterating (repeating) length units. • Order three objects by length. Compare the lengths of two objects indirectly by using a third object. **(1.MD.1)** • Express the length of an object as a whole number of length units (non-standard), by laying multiple copies of a shorter object (the length unit) end to end; • Understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.* **(1.MD.2)** **Time and Money** • Tell and write time in hours and half-hours using analog and digital clocks. **(1.MD.3)** ***Recognize and identify coins, their names, and their value.*** **Represent and interpret data.** • Organize, represent, and interpret data with up to three categories. 1. Ask and answer questions about the total number of data points 2. Identify how many in each category 3. Identify how many more or less are in one category than in another. **(1.MD.4)**	Use teddy bears, paper clip, unifix cubes Pictograph, Bar graph, Venn diagram, Tally graph, Survey, Table

Measurement and Data Vocabulary		
Amount	Hour	Nonstandard units
Analog clock	Hour hand	Objects
Cent	Interpret	Organize
Coin	Iterating	Overlap
data	Length	Penny
Digital clock	Less	Quarter
Dime	Long	Represent
Gap	Measure	Span
Graph	Minute hand	Time
Half hour	Money	Units
	More	
	Nickel	

Geometry	**1.G**	
Reason with shapes and their attributes.		
• Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size) **(1.G.1)**		Build and draw shapes to possess **defining** attributes
• Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape. **(1.G.2)**		Put two triangles together to make a quadrilateral
Students do not need to learn formal names such as "right rectangular prism".		Each piece of the whole circle is a fourth.
• Partition circles and rectangles into two and four equal shares by • Describing the shares using the *words halves, fourths,* and *quarters,* and use the phrases *half of, fourth of,* and *quarter of.* • Describe the whole as two of, or four of the shares. • Understand for these examples that decomposing into more equal shares creates <u>smaller shares</u>. **(1.G.3)**		

Geometry Vocabulary			
Attributes	Equal Shares	Quarters (quarter of)	Slide
Between	Flip	Rectangle	Sphere
Circle	Fourths (fourth of)	Right Circular Cone	Square
Closed	Half Circle	Right Circular Cylinder	Symmetry
Composite	Halves (half of)	Right Rectangular Prism	Triangle
Cone	Hexagon	Same	Trapezoid
Corner	Horizontal	Side	Turn
Cube	Part	Similar	Vertical
Cylinder			Whole
Decompose			
Dimensional (2-D & 3-D)			

Grade 1 Pacing Guide	September	Resources
Extend the counting sequence. (Kindergarten was taught counting to 100) Count to 120, starting at any number less than 120. (ongoing) • Read and write numerals. • Represent a number of objects with a written numeral. (**1.NBT.1)** **Represent and interpret data.** (Introduction to Graphing Unit) • Organize, represent, and interpret data with up to three categories. (ongoing) • Ask and answer questions about the total number of data points • Identify how many in each category • Identify how many more or less are in one category than in another. (**1.MD.5)**		***Counting Literature*** *Every Buddy Counts* by Stuart Murphy *Ten Black Dots* by Donald Crews *From One to One Hundred* by Teri Sloat *The Icky Bug Counting Book* by Jerry Pallotta *Mouse Count* by Ellen Stoll Walsh ***Graphing Literature*** *The Best Vacation Ever* by Stuart Murphy *The Great Graph Contest* by Loreen Leedy *Tally O'Mally* by Stuart Murphy *How Many Snails*? By Paul Giganti, Jr. *100th Day* Worries by Margery Cuyler *The Wolf's Chicken* Stew by Keiko Kasza ***Online Resources*** (Count Us In Counting Game) (Number Matching) Number Order Graph Lesson Graphing Activity

Grade 1 Pacing Guide	October	Resources
Extend the counting sequence. • Count to 120, starting at any number less than 120. (ongoing) **Represent and interpret data.** • Organize, represent, and interpret data with up to three categories. (ongoing) **Focus on Addition to 10** **Represent and solve problems involving addition and subtraction.** • Use **addition** and subtraction within 20 to solve word problems by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. (**1.0A.1)** • **adding to** • taking from • **putting together** • taking apart • comparing • solving with unknowns in all positions **Understand and apply properties of operations and the relationship between addition and subtraction.** • Apply properties of operations as strategies to add and subtract. **(1.OA.3)** *Students need not use formal terms for these properties.*		***Literature*** *Animals on Board* by Stuart Murphy *Domino Addition* by Lynette Long *One More Bunny* by Rick Walton ***Online Resources for Addition Practice*** **Adding Practice** **Addition Facts**

Grade 1 Pacing Guide	November	Resources
Focus on Subtraction from 10 **Represent and solve problems involving addition and subtraction.** • Use addition and **subtraction** within 20 to solve word problems by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. (**1.0A.1)** • adding to • **taking from** • putting together • **taking apart** • comparing • solving with unknowns in all positions **Understand and apply properties of operations and the relationship between addition and subtraction.** • Apply properties of operations as strategies to add and subtract. (**1.OA.3)** *See Table 1 in Glossary for Examples.* *Students need not use formal terms for these properties.* • Understand subtraction as an unknown-addend problem. (ongoing) (**1.OA.4)**		***Literature*** *Elevator Magic* by Stuart Murphy *Monster Musical* Chairs by Stuart Murphy *The Action of Subtraction* by Brian Cleary *How Many Blue Birds Flew Away?* By Paul Giganti *Online Resources for Subtraction Practice* ***Online Resources*** ***(Subtraction drill and practice)*** ***(Math Magician Subtraction drill and practice)*** ***(Subtraction Bowling)***

Grade 1 Pacing Guide	December	Resources
Geometry **Reason with shapes and their attributes.** (3-D shapes taught in Kindergarten were cubes, cones, cylinders, spheres) • Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size) **(1.G.1)** • Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape. **(1.G.2)** • Partition circles and rectangles into two and four equal shares by describing the shares using the *words halves, fourths,* and *quarters*, and use the phrases *half of, fourth of,* and *quarter of.* • Describe the whole as two of, or four of the shares. • Understand for these examples that decomposing into more equal shares creates smaller shares. **(1.G.3)** ***Review Addition and Subtraction to 10*** • Use addition and subtraction within 20 to solve word problems by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. (**1.0A.1)**		***Literature*** *Sea Shapes* by Suse MacDonald *Picture Pie* by Ed Emberley *The Silly Story of Goldie Locks and the Three Squares* by Grace Maccarone *Color Zoo* by Lois Ehlert *The Greedy Triangle* by Marilyn Burns ***Online Resources*** **Identifying Shapes**

Grade 1 Pacing Guide	January/February	Resources
Add and subtract within 20. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. (**1.OA.6)** • Use strategies such as: • counting on • making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14) • decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9) • using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4) • creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13). • Relate counting to addition and subtraction. Example: skip-counting, number patterns, counting forward and backwards (**1.OA.5)** • Understand the meaning of the equal sign (equal sign means the **same value** on both sides) • Determine if equations involving addition and subtraction are true or false. (**1.OA.7)** • Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. (**1.OA.8)**		***Literature*** *Mission Addition by* Loreen Leedy *12 Ways to Get to 11* by Eve Merriam *Subtraction Action* by Loreen Leedy *How Many Snails?* By Paul Giganti *Each Orange Had 8 Slices* by Paul Giganti *Online Resources* **Relating Addition to Subtraction** **Finding the Unknown Number in an Equation with Number Bonds**

Grade 1 Pacing Guide	March/April	Resources
Understand place value Understand that the two digits of a two-digit number represent amounts of tens and ones. (**1.NBT.2)** **Understand the following as special cases:** • 10 can be thought of as a bundle of ten ones — called a "ten." • The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. • The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones). • Compare two two-digit numbers (based on meanings of the tens and ones digits), recording the results of comparisons with the symbols >, =, and <. (**1.NBT.3)** **Use place value understanding and properties of operations to add and subtract.** • Add within 100 including: • adding a two-digit number and a one-digit number (51 + 2) • adding a two-digit number and a multiple of 10 (26 + 30) • using concrete models or drawings and strategies based on place value • properties of operations, and/or the relationship between addition and subtraction • relate the strategy to a written method and explain the reasoning used Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. (**1.NBT.4)** • Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. (**1.NBT.5)** • Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 by: (positive or zero differences). (**1.NBT.6)** • using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction • relating the strategy to a written method and explain the reasoning used.	***Literature*** *Earth Day… Hoorah!* by Stewart Murphy *How Much is a Million?* by David Schwartz *100th Day* Worries by Margery Cuyler ***Online Resources*** Place Value Tens and Ones Shark Pool Place Value Comparing Number Values

Grade 1 Pacing Guide	May	Resources

Measurement and Data
Measure lengths indirectly and by iterating (repeating) length units.

- Order three objects by length. Compare the lengths of two objects indirectly by using a third object. (**1.MD.1)**

- Express the length of an object as a whole number of length units (non-standard), by laying multiple copies of a shorter object (the length unit) end to end;
- Understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.* (**1.MD.2)**

Time and Money

- Tell and write time in hours and half-hours using analog and digital clocks. (**1.MD.3)**
- Recognize and identify coins, their names, and their value**. (1.MD.4)**

Represent and interpret data.

- Organize, represent, and interpret data with up to three categories.
- ask and answer questions about the total number of data points
- identify how many in each category
- identify how many more or less are in one category than in another. (**1.MD.5)**

Literature
Alexander, Who Used to Be Rich Last Sunday by Judith Viorst
The Grouchy Ladybug by Eric Carle
How Big Is A Foot? By Rolf Myller

Online Resources
Telling Time

Telling & Making Time

Matching Coins to Value

Identifying Coin Value

Measuring With Non-Standard Units

Grade 1 Pacing Guide	June	Resources

• Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20
Examples: by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. (**1.OA.2)**
 	
• Review and extend previous understanding of addition and subtraction within 20, demonstrating fluency for addition and subtraction within 10. (**1.OA.6)**
• Use strategies such as:
  • counting on
  • making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14)
  • decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9)
  • using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4)
  • creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known
  • equivalent 6 + 6 + 1 = 12 + 1 = 13).		

Mathematics - Grade 2: Introduction

In Grade 2, instructional time should focus on four critical areas: (1) extending understanding of base-ten notation; (2) building fluency with addition and subtraction; (3) using standard units of measure; and (4) describing and analyzing shapes.

1. Students extend their understanding of the base-ten system. This includes ideas of counting in fives, tens, and multiples of hundreds, tens, and ones, as well as number relationships involving these units, including comparing. Students understand multi-digit numbers (up to 1000) written in base-ten notation, recognizing that the digits in each place represent amounts of thousands, hundreds, tens, or ones (e.g., 853 is 8 hundreds + 5 tens + 3 ones).

2. Students use their understanding of addition to develop fluency with addition and subtraction within 100. They solve problems within 1000 by applying their understanding of models for addition and subtraction, and they develop, discuss, and use efficient, accurate, and generalizable methods to compute sums and differences of whole numbers in base-ten notation, using their understanding of place value and the properties of operations. They select and accurately apply methods that are appropriate for the context and the numbers involved to mentally calculate sums and differences for numbers with only tens or only hundreds.

3. Students recognize the need for standard units of measure (centimeter and inch) and they use rulers and other measurement tools with the understanding that linear measure involves an iteration of units. They recognize that the smaller the unit, the more iterations they need to cover a given length.

4. Students describe and analyze shapes by examining their sides and angles. Students investigate, describe, and reason about decomposing and combining shapes to make other shapes. Through building, drawing, and analyzing two- and three-dimensional shapes, students develop a foundation for understanding area, volume, congruence, similarity, and symmetry in later grades.

Grade 2 Overview

Operations and Algebraic Thinking
- Represent and solve problems involving addition and subtraction.
- Add and subtract within 20.
- Work with equal groups of objects to gain foundations for multiplication.

Number and Operations in Base Ten
- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

Measurement and Data
- Measure and estimate lengths in standard units.
- Relate addition and subtraction to length.
- Work with time and money.
- Represent and interpret data.

Geometry
- Reason with shapes and their attributes.

Mathematics – Second Grade Common Core Learning Standards

Operations & Algebraic Thinking **2.OA**	**Example**
Represent and solve problems involving addition and subtraction. • Use addition and subtraction within 100 to solve problems with unknowns in all positions (result unknown, change unknown, start unknown) by: *adding to *taking from *putting together *taking apart *comparing (2.OA.1) • Use addition and subtraction within 100 to solve one- and two-step **word problems** with unknowns in all positions (result unknown, change unknown, start unknown) by: *adding to *taking from *putting together *taking apart *comparing (2.OA.1) ****See Table 1 and glossary for examples. Note the use of language in each word problem.* • Understand that whole numbers can be decomposed with different combinations of unknown addends. (2.OA.1) **Add and subtract within 20.** • Fluently add and subtract within 20 using **mental** strategies. (By end of Grade 2, know from memory, all sums of two one-digit numbers.) *counting on	**Result :** 2+3=? OR 8-5=? **Change**: 2+?=5 OR 8-?=5 **Start:** ?+3=5 OR ?-3=5 Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? 5 = 0 + 5, 5 = 5 + 0 5 = 1 + 4, 5 = 4 + 1 5 = 2 + 3, 5 = 3 + 2

*making ten *decomposing a number leading to a ten *using the relationship between addition and subtraction(inverse operations) *creating equivalent but easier or known sums (using doubles) (2.OA.2) **Work with equal groups of objects to gain foundations for multiplication.** • Determine whether a group of objects (up to 20) has an odd or even number of members by pairing objects (using manipulatives/drawings) or skip counting by 2s. (2.OA.3) • Write an equation to express an even number as a sum of two equal addends. (2.OA.3) • Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends. (2.OA.4)	8 + 6 = 8 + 2 + 4 = 10 + 4 = 14 13 – 4= 13 – 3 – 1 = 10 – 1 = 9 If 8 + 4 = 12, then12 – 8 = 4 6 + 7 is the same as 6 + 6 + 1 = 13. 20 = 10 + 10 4 + 4 + 4 = 12 **** **** ****

Operations & Algebraic Thinking Vocabulary		
Add	Doubles plus one	Skip counting
Add to	Doubles minus one	Subtract
Addend	Even	Sum
Altogether	Fact family	Symbol
Array	Inverse operations	Taking apart
Combinations	Making Ten	Taking from
Compare	Number sentence	Turn around
Compose	Odd	Unknowns
Counting On	Putting together	Word problem
Decompose	Related facts	
Difference	Repeated addition	
Doubles		

Numbers & Operations in Base Ten 2.NBT	Example
Understand place value.	For example, 706 equals 7 hundreds, 0 tens, and 6 ones.
• Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones. (2.NBT.1) a. 100 can be thought of as a bundle of ten tens — called a "hundred." (2.NBT.1a) b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones). (2.NBT.1b)	
• Count within 1000; skip-count by 5s, 10s, and 100s. (2.NBT.2)	
• Read and write numbers to 1000 using base-ten numerals (standard form), number names (word form), and expanded form. (2.NBT.3)	762 (standard) seven hundred sixty-two (word) 700 + 60 + 2 (expanded)
• Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons. (2.NBT.4)	
Use place value understanding and properties of operations to add and subtract.	
• Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. (2.NBT.5)	
• Add up to four two-digit numbers using strategies based on place value and properties of operations. *Associative property of addition *Commutative property of addition *Additive identity property of 0 (2.NBT.6)	(2 + 3) + 4 = 2 + (3 + 4) 2 + 3 = 3 + 2 2 + 0 OR 0 + 2 = 2
• Add and subtract within 1000, (understanding that in adding or subtracting three-digit numbers, the numbers need to be aligned according to their place; and sometimes it is necessary to compose or decompose tens or hundreds) using: *concrete models or drawings *strategies based on place value	781- ? = 779 – 5 Input/Output Table

*properties of operations *the relationship between addition and subtraction *relate the strategy to a written method. (2.NBT.7) • Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900 (2.NBT.8) • Explain why addition and subtraction strategies work, using place value and the properties of operations. Explanations may be supported by writing, drawing, or using objects. (2.NBT.9)	546 + ___?__ 553 Fact families Related Addition/Subtraction Facts

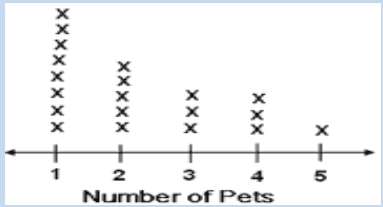
Numbers & Operations in Base Ten Vocabulary		
Additive identity property of 0	Greater than (>)	Skip counting by 100
Associative property of +	Hundreds	Skip counting by 5
Commutative property of +	Less than (<)	Standard form
Compose	Mental math	Tens
Decompose	Ones	Thousands
Digit	Place value	Three-digit number
Equal to (=)	Regroup	Two-digit number
Expanded form	Skip counting by 10	

Measurement and Data **2.MD**	**Example**
Measure and estimate lengths in standard units. • Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. (2.MD.1) • Measure the length of an object twice, using units of different lengths (ie. inches and feet) and describe how the two measurements relate to the size of the unit chosen. (2.MD.2) • Estimate lengths using units of inches, feet, centimeters, and meters. (2.MD.3) • Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit. (2.MD.4) **Relate addition and subtraction to length.** • Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. (2.MD.5) • Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram. (2.MD.6) **Work with time and money.** • Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m. (2.MD.7) • Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. (2.MD.8)	If you have 2 dimes and 3 pennies, how many cents do you have?

Represent and interpret data.

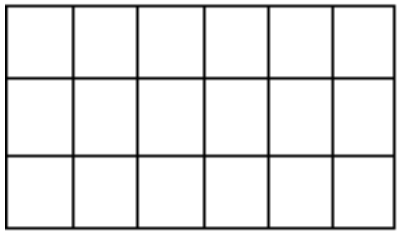
- Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a **line plot**, where the horizontal scale is marked off in whole-number units. (2.MD.9)

- Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problem using information presented in a bar graph. (2.MD.10)



Measurement & Data Vocabulary

a.m./p.m.	Feet	Minute
Analog clock	Half hour	Minute hand
Axis	Half hour	Nickel
Bar graph	Horizontal scale	Number line diagram
Category	Hour	Penny
Cent (¢)	Hour hand	Picture graph
Centimeter (cm)	Inch (in.)	Quarter
Customary system	Length	Ruler
Data	Line plot	Scale
Digital clock	Measurement	Single unit scale
Dime	Measuring tape	Standard unit
Dollar ($)	Meter (m)	Unit
Equivalent	Meter stick	Yardstick
Estimate	Metric system	

Geometry	**2.G**	**Example**
Reason with shapes and their attributes. • Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes. (2.G.1) • Partition a rectangle into rows and columns of same-size squares and count to find the total number of them (area). (2.G.2) • Partition circles and rectangles into two, three, or four equal shares, and: *describe the shares using the words halves, thirds, half of, a third of, etc. *describe the whole as two halves, three thirds, four fourths. *recognize that equal shares of identical wholes need not have the same shape. (2.G.3)		A triangle has 3 sides and 3 angles. What is the area? 

Geometry Vocabulary		
2-dimensional	Four Fourths	Rectangular prism
3-dimensional	Fourth of	Row
Angle	Fourths	Shape
Area	Half of	Sphere
Attribute	Halves	Square
Circle	Hexagon	Third of
Column	Identical wholes	Thirds
Cone	Partition	Three Thirds
Cube	Pentagon	Trapezoid
Cube	Pyramid	Triangle
Cylinder	Quadrilateral	Two halves
Equal shares	Quarters	Whole
Face	Rectangle	

Grade 2 Pacing Guide	September	Resources
Measurement and Data **Represent and interpret data.** • Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problem using information presented in a bar graph. (2.MD.10)		***Literature*** *The Great Graph Contest* by Loreen Leedy *How the Second Grade Got $8,205.50 to Visit the Statue of Liberty*-Nathan Zimelman *Lemonade for Sale*- Stuart Murphy *Mama Bear*-Chyng Feng Sun *The Best Vacation Ever* by Stuart J. Murphy ***Online Resources*** "Button Bar Graph" "Button Pictograph" "Collecting and Representing Data" The Graph Club software program

Grade 2 Pacing Guide	October	Resources
Operations & Algebraic Thinking **Add and subtract within 20.** • Fluently add and subtract within 20 using **mental** strategies. (By end of Grade 2, know from memory, all sums of two one-digit numbers.) *counting on *making ten (e.g.,); *decomposing a number leading to a ten *using the relationship between addition and subtraction(inverse operations) *creating equivalent but easier or known sums (using doubles) (2.OA.2) • Understand that whole numbers can be decomposed with different combinations of unknown addends. (2.OA.1) **Represent and solve problems involving addition and subtraction.** • Apply and extend addition and subtraction within 20 to solve **word problems** with unknowns in all positions (result unknown, change unknown, start unknown) by: *adding to *taking from *putting together *taking apart *comparing (2.OA.1) ***Numbers & Operations in Base Ten*** **Use place value understanding and properties of operations to add and subtract.** • Explain why addition and subtraction strategies work, using place value and the properties of operations. Explanations may be supported by writing, drawing, or using objects. (2.NBT.9)		***Online Resources*** "Magic Triangles" "3x3 Magic Squares" Power Lines "Nine Plus" "Fact Family House" "Doubles Plus One" "Doubles Minus One" "Eleven More" "Number Relationships"/ "Mat" Dudes Dilemma Math Magician

Grade 2 Pacing Guide	November	Resources
Numbers & Operations in Base Ten **Understand place value.** • Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones. (2.NBT.1) a. 100 can be thought of as a bundle of ten tens — called a "hundred." (2.NBT.1a) b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones). (2.NBT.1b) • Count within 1000; skip-count by 5s, 10s, and 100s. (2.NBT.2) • Read and write numbers to 1000 using base-ten numerals (standard form), number names (word form), and expanded form. (2.NBT.3) • Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons. (2.NBT.4) • Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900 (2.NBT.8) **Use place value understanding and properties of operations to add and subtract.** • Explain why addition and subtraction strategies work, using place value and the properties of operations. Explanations may be supported by writing, drawing, or using objects. (2.NBT.9)		***Online Resources*** Base Ten Blocks "3-digit Base Ten Concentration" "Count by Fives"/ "Mat" "Count by Tens"/ "Mat" "Order Up" "Number Word Concentration" "Representing Numbers 4 Ways" "Roll 3 Digits" "Comparing 3-digit Numbers" "Place Value Challenge" "Plus-Minus-Stay the Same Game"

Grade 2 Pacing Guide	December	Resources
Numbers & Operations in Base Ten **Use place value understanding and properties of operations to add and subtract.** • Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. (2.NBT.5) • Add up to four two-digit numbers using strategies based on place value and properties of operations. *Associative property of addition *Commutative property of addition *Additive identity property of 0 (2.NBT.6) • Explain why addition and subtraction strategies work, using place value and the properties of operations. Explanations may be supported by writing, drawing, or using objects. (2.NBT.9) **Operations & Algebraic Thinking** **Represent and solve problems involving addition and subtraction.** • Use addition and subtraction within 100 to solve problems with unknowns in all positions (result unknown, change unknown, start unknown) by: *adding to *taking from *putting together *taking apart *comparing (2.OA.1) • Use addition and subtraction within 100 to solve one- and two-step **word problems** with unknowns in all positions (result unknown, change unknown, start unknown) by: *adding to *putting together *comparing (2.0A.1) *taking apart * taking from		***Online Resources*** Close to 100 Keep on Doubling ***Teacher Resources*** Marilyn Burns' Game of Pig

Grade 2 Pacing Guide	January	Resources
Numbers & Operations in Base Ten **Use place value understanding and properties of operations to add and subtract.** • Add and subtract within 1000, (understanding that in adding or subtracting three-digit numbers, the numbers need to be aligned according to their place; and sometimes it is necessary to compose or decompose tens or hundreds) using: *concrete models or drawings *strategies based on place value *properties of operations *the relationship between addition and subtraction *relate the strategy to a written method. (2.NBT.7) **Operations & Algebraic Thinking** **Represent and solve problems involving addition and subtraction.** • Use addition and subtraction within 1000 to solve **word problems** with unknowns in all positions (result unknown, change unknown, start unknown) by: *adding to *taking from *putting together *taking apart comparing (2.OA.1- Please note the change from 100 to 1000)		***Literature*** *A Fair Bear Share* Stuart Murphy *One Grain of Rice* by Demi *Five Hundred Hats of Bartholomew Cubbins* by Dr. Seuss

Grade 2 Pacing Guide	February	Resources
Measurement and Data **Work with time and money.** • Apply and extend the recognition and identification of coins, their names, and their values. • Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. (2.MD.8)		***Literature*** *Alexander Who Used to be Rch Last Sunday* by Judith Viorst *Benny's Pennies* by Pat Brisson *Pigs Will be* Pigs by Amy Axelrod *Sluggers' Car Wash* by Stuart Murphy ***Online Resources*** Coin Combos Shopping Cash Out Counting Money "Make A Dollar"

Grade 2 Pacing Guide	March	Resources
Measurement and Data **Measure and estimate lengths in standard units.** • Apply and extend the use of a non-standard unit of measurement. • Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. (2.MD.1) • Measure the length of an object twice, using units of different lengths (ie. inches and feet) and describe how the two measurements relate to the size of the unit chosen. (2.MD.2) • Estimate lengths using units of inches, feet, centimeters, and meters. (2.MD.3) • Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit. (2.MD.4) **Relate addition and subtraction to length.** • Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. (2.MD.5) • Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram. (2.MD.6) **Represent and interpret data.** • Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a **line plot**, where the horizontal scale is marked off in whole-number units. (2.MD.9)		***Online Resources*** "Measuring Strips" "Measuring Paths"/ "Mat 1" "Mat 2" "Mat 3" "Are you a square or a rectangle?" "Length Word Problems"

Grade 2 Pacing Guide	April	Resources
Measurement and Data **Work with time and money.** • Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m. (2.MD.7)		***Literature*** *Clocks and More Clocks* by Pat Hutchins *Pigs on a Blanket* by Amy Axelrod *Get Up and Go* by Stuart Murphy ***Online Resources*** Stop the Clock Willy the Watchdog "Time Barrier Game"/ Clockmaker Bedtime Bandits Clockworks "Mat"

Grade 2 Pacing Guide	May	Resources
Geometry **Reason with shapes and their attributes.** • Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes. (2.G.1) • Partition a rectangle into rows and columns of same-size squares and count to find the total number of them (area). (2.G.2) • Partition circles and rectangles into two, three, or four equal shares, and: *describe the shares using the words halves, thirds, half of, a third of, etc. *describe the whole as two halves, three thirds, four fourths. *recognize that equal shares of identical wholes need not have the same shape. (2.G.3)		***Literature*** *Captain Invincible and the Space Shapes* by Stuart Murphy *A Cloak for a Dreamer* by Aileen Friedman ***Online Resources*** "Making Rectangles" "Fraction Barrier Game"/ "Mat"

Grade 2 Pacing Guide	June	Resources
Operations & Algebraic Thinking **Work with equal groups of objects to gain foundations for multiplication.** • Determine whether a group of objects (up to 20) has an odd or even number of members by pairing objects (using manipulatives/drawings) or skip counting by 2s. (2.OA.3) • Write an equation to express an even number as a sum of two equal addends. (2.OA.3) • Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends. (2.OA.4)		***Literature*** *Even Stephen Odd Todd* by Kathryn Cristaldi *Bunches and Bunches of Bunnies* by Louis Mathews *Amanda Bean's Amazing Dream* by Cindy Neuchwander ***Online Resources*** "Different Sized Squares" 2 Times Table Time Table Practice Table Trees "Making Arrays"

Mathematics - Grade 3: Introduction

In Grade 3, instructional time should focus on four critical areas: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes.

1. Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.

2. Students develop an understanding of fractions, beginning with unit fractions. Students view fractions in general as being built out of unit fractions, and they use fractions along with visual fraction models to represent parts of a whole. Students understand that the size of a fractional part is relative to the size of the whole. For example, 1/2 of the paint in a small bucket could be less paint than 1/3 of the paint in a larger bucket, but 1/3 of a ribbon is longer than 1/5 of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts. Students are able to use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

3. Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps, a square with sides of unit length being the standard unit for measuring area. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle.

4. Students describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles, and connect these with definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

Grade 3 Overview

Operations and Algebraic Thinking
- Represent and solve problems involving multiplication and division.
- Understand properties of multiplication and the relationship between multiplication and division.
- Multiply and divide within 100.
- Solve problems involving the four operations, and identify and explain patterns in arithmetic.

Number and Operations in Base Ten
- Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions
- Develop understanding of fractions as numbers.

Measurement and Data
- Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
- Represent and interpret data.
- Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
- Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Geometry
- Reason with shapes and their attributes.

Mathematics – Third Grade Common Core Learning Standards

Operations & Algebraic Thinking **3.OA**	**Examples**
Represent and solve problems involving multiplication and division. • Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. (3.OA.1)	Describe a context in which a total number of objects can be expressed as 5 × 7.
• Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. (3.OA.2)	Describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.
• Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities. (3.OA.3)	Use drawings and equations with a symbol for the unknown number to represent the problem.
• Determine the unknown whole number in a multiplication or division equation relating three whole numbers. (3.OA.4)	To determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = _ ÷ 3, 6 × 6 = ?
Understand properties of multiplication and the relationship between multiplication and division. • Apply properties of operations as strategies to multiply and divide. (Students need not use the formal terms for these properties. (3.OA.5)	If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.)
• Understand division as an unknown-factor problem. (3.OA.6)	3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.)
Multiply and divide within 100. • Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. **By the end of Grade 3, know from memory all products of two one-digit numbers.** (3.OA.7)	Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)

Solve problems involving the four operations, and identify and explain patterns in arithmetic. • Solve two-step word problems using the four operations. Represent these problems using equations **with a letter standing for the unknown quantity.** Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (3.OA.8) • Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. (3.OA.9)	Find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8. *This standard is limited to problems posed with whole numbers and having whole number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order. (order of operations – PEMDAS)* Observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.

Operations & Algebraic Thinking Vocabulary		
Addend Array Associative property Commutative Commutative property Decomposed Difference Distributive property	Division Estimation Equation Factor Multiplication Operations Partitioned equally Product	Property Quotient Rounding Sum Unknown quantity

Number and Operations in Base Ten 3.NBT	Example
Use place value understanding and properties of operations to perform multi-digit arithmetic. • Use place value understanding to round whole numbers to the nearest 10 or 100. (3.NBT.1) • Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. (3.NBT.2) • Multiply one-digit whole numbers by multiples of 10 in the range 10–90 using strategies based on place value and properties of operations. (3.NBT.3)	*A range of algorithms may be used.* 9 × 80, 5 × 60

Number and Operations in Base Ten Vocabulary		
Algorithm Digit Multiple	Place value Properties of operations Range	Rounding Whole number

Number and Operations in Fractions **3.NF**	**Example**
Develop understanding of fractions as numbers. Understand a fraction 1/*b* as the quantity formed by 1 part when *a* whole is partitioned into *b* equal parts; understand a fraction *a*/*b* as the quantity formed by a parts of size 1/*b*. (3.NF.1)	***Limited to fractions with denominators 2, 3, 4, 6, 8.***
• Understand a fraction as a number on the number line; represent fractions on a number line diagram. (3.NF.2a)	
• Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line. (3.NF.2a)	
• Represent a fraction *a*/*b* on a number line diagram by marking off a lengths 1/*b* from 0. Recognize that the resulting interval has size *a*/*b* and that its endpoint locates the number *a*/*b* on the number line. (3.NF.2b)	
Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. (3.NF.3)	
• Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. (3.NF.3a)	1/2 = 2/4, 4/6 = 2/3. Explain why the fractions are equivalent, e.g., by using a visual fraction model.
• Recognize and generate simple equivalent fractions. (3.NF.3b)	Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.
• Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. (3.NF.3c)	

• Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. (3.NF.3d)	

Number and Operations in Fractions Vocabulary		
Denominator Endpoint Equivalent Fraction Greater than	Interval Less than Number line Numerator	Represent Unit fraction Visual fraction model Whole

Measurement and Data **3.MD**	**Example**
Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. • Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes. (3.MD.1)	Represent the problem on a number line diagram.
• Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).1 Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3.MD.2)	*Excludes compound units such as cm^3 and finding the geometric volume of a container.*
Represent and interpret data. • Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. (3.MD.3)	Draw a bar graph in which each square in the bar graph might represent 5 pets.
• Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. **Show the data by making a line plot**, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters. (3.MD.4)	
Geometric measurement: understand concepts of area and relate area to multiplication and to addition. • Recognize area as an attribute of plane figures and understand concepts of area measurement. (3.MD.5)	

• A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area. (3.MD.5a)	
• A plane figure, which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units. (3.MD.5b)	
• Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). (3.MD.6)	
• Relate area to the operations of multiplication and addition. (3.MD.7)	
• Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. (3.MD.7a)	
• Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. (3.MD.7b)	
• Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning. (3.MD.7c)	
• Recognize area as additive. Find areas of rectilinear figures (a polygon with all right angles) by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems. (3.MD.7d)	5x12 = 5x10 + 5x2 = 50 + 10 = 60

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures. • . Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters. (3.MD.8)	

Measurement & Data Vocabulary		
Analog clock	Horizontal scale	Polygon
Area	Kilograms	Quarter inch
Attribute	Line plot	Rectilinear
Bar graph	Linear	Scale
Customary units of length	Liter	Standard units
Data	Mass	Tiling
Foot	Metric system	Time
Gaps	One square unit	Time intervals
Grams	Overlaps	Unit square (sq. cm)
Half inch	Perimeter	Volume
	Pictograph	Yard
	Plane	

Geometry 3.G	Example
Reason with shapes and their attributes. • Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories. (3.G.1) • Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.* (3.G.2)	

Geometry Vocabulary		
Attribute Categories Closed figure Cones Cubes Cylinders	Hexagon Open figure Parallelogram Pentagon Polygon Properties	Quadrilateral Rectangle Rhombus Sphere Three dimensional Two dimensional

Grade 3 Pacing Guide	September	Resources
Use place value understanding and properties of operations to perform multi-digit arithmetic. • Use place value understanding to round whole numbers to the nearest 10 or 100. (3.NBT.1) • Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. (3.NBT.2) Note: Place value 1 through 1,000 is part of grade 2 common core state standards.		***Literature*** *A Million Fish…More or Less* by Pat McKissack *How Much is a Million?* By David M. Schwartz *Just Add Fun* by Joanne Rocklin *Mission Addition* by Loreen Leedy ***Online Resources*** "Round to the Nearest Ten Game" "Round to the Nearest Hundred Game "Doubling to 1000" "Difference Add"

Grade 3 Pacing Guide	October	Resources
The concept of multiplication should be introduced in October. Once the concept has been mastered, a new multiplication table can be introduced each week concurrently with graphing. **Represent and solve problems involving multiplication and division. (Multiplication only)** • Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. (3.OA.1) • Use **multiplication** and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities. (3.OA.3) • Determine the unknown whole number in a **multiplication** or division equation relating three whole numbers. (3.OA.4) **Understand properties of multiplication and the relationship between multiplication and division.** • Apply properties of operations as strategies to multiply and divide. (Students need not use the formal terms for these properties. (3.OA.5) • Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. (3.OA.9) **Represent and interpret data.** • Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. (3.MD.3)		***Literature*** *100 Hungry Ants* by Elinor Pinczes *2x2=Boo!* By Loreen Leedy *Amanda Bean's Amazing Dream* by Cindy Neuchwander *Hershey's From Addition to Multiplication* by Jerry Pallotta *The Hershey's Multiplication Book* by Jerry Pallotta ***Online Resources*** "Equal Rows in a Marching Band" "Sharing Marbles Equally" "Missing Numbers" "Increasing and Decreasing Number Patterns" "Button Bar Graph" "Button Pictograph" "Jake's Survey" "Collecting and Representing Data" "Array Picture Cards"

Grade 3 Pacing Guide	November	Resources
Note: Multiplication tables should continue to be introduced and practiced. **Geometric measurement: understand concepts of area and relate area to multiplication and to addition.** • Recognize area as an attribute of plane figures and understand concepts of area measurement. (3.MD.5) • A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area. (3.MD.5a) • A plane figure, which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units. (3.MD.5b) • Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). (3.MD.6) • Relate area to the operations of multiplication and addition. (3.MD.7) • Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. (3.MD.7a) • Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. (3.MD.7b) • Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning. (3.MD.7c) • Recognize area as additive. Find areas of rectilinear figures (a polygon with all right angles) by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems. (3.MD.7)		***Online Resources*** "Exploring Area" "Area on the Geoboard" "Developing the Formula for Area" "Designing a Flower Bed" "Areas of Irregular Figures"

Grade 3 Pacing Guide	December	Resources
Represent and solve problems involving multiplication and division. • Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. (3.OA.2) • Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities. (3.OA.3) • Determine the unknown whole number in a multiplication or division equation relating three whole numbers. (3.OA.4) **Understand properties of multiplication and the relationship between multiplication and division.** • Apply properties of operations as strategies to multiply and divide. (Students need not use the formal terms for these properties. (3.OA.5) • Understand division as an unknown-factor problem. (3.OA.6) **Multiply and divide within 100.** • Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. **By the end of Grade 3, know from memory all products of two one-digit numbers.** (3.OA.7)		***Literature*** *Divide and Ride* by Stuart Murphy *The Great Divide* by Dayle Ann Dodds ***Online Resources*** Multiplication/Division Number Stories Division Spin Division Spin (Divide by 10)

Grade 3 Pacing Guide	January	Resources

Solve problems involving the four operations, and identify and explain patterns in arithmetic.

- Solve two-step word problems using the four operations. Represent these problems using equations **with a letter standing for the unknown quantity.** Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (3.OA.8)

- Multiply one-digit whole numbers by multiples of 10 in the range 10–90 using strategies based on place value and properties of operations. (3.NBT.3)

Develop understanding of fractions as numbers.
Understand a fraction 1/*b* as the quantity formed by 1 part when *a* whole is partitioned into *b* equal parts; understand a fraction *a*/*b* as the quantity formed by a parts of size 1/*b*. (3.NF.1)

- Understand a fraction as a number on the number line; represent fractions on a number line diagram. (3.NF.2a)

- Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line. (3.NF.2a)

- Represent a fraction *a*/*b* on a number line diagram by marking off a lengths 1/*b* from 0. Recognize that the resulting interval has size *a*/*b* and that its endpoint locates the number *a*/*b* on the number line. (3.NF.2b)

Literature

Apple Fractions by Jerry Pallotta
Each Orange Had Eight Slices by Paul Giganti
Fraction Action by Loreen Leedy
Fraction Fun by David Adler
Give Me Half by Stuart Murphy
The Hershey's Fraction Book by Jerry Pallotta

Online Resources

"Two Step Word Problems"
"Two Step Word Problems Set 2"
"Multiples of Ten Multiply"
"Fractions with Color Tiles"

Grade 3 Pacing Guide	February	Resources
Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. (3.NF.3) • Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. (3.NF.3a) • Recognize and generate simple equivalent fractions. (3.NF.3b) • Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. (3.NF.3c) • Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. (3.NF.3d)		***Online Resources*** "Build a Hexagon" "Building Equivalent Fractions"

Grade Three Pacing Guide	March	Resources
Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. • Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes. (3.MD.1) Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).1 Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3.MD.2) • Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. **Show the data by making a line plot**, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters. (3.MD.4)		***Literature*** *Clocks and More Clocks* by Pat Hutchins *Game Time* by Stuart Murphy *Time* by Henry Pluckrose *Capacity* by Henry Pluckrose ***Online Resources*** "Elapsed Time Ruler" "Elapsed Time Word Problems" "More or Less Than a Liter" "Measuring Strips Line Plot"

Grade Three Pacing Guide	April	Resources
Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures. • . Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters. (3.MD.8) **Reason with shapes and their attributes.** • Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories. (3.G.1) • Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.* (3.G.2)		***Literature*** *Shape* by Henry Pluckrose *The Greedy Triangle* by Marilyn Burns *Shape Up!* By David Adler ***Online Resources*** "Perimeter on the Geoboard" "The Perimeter Stays the Same" "Geoboard Fourths" "Congruent Eighths"

Grade Three Pacing Guide	May	Resources
Review and Test Prep		

Grade Three Pacing Guide	June	Resources
Math Extension Projects **Review Place Value and Multiplication/ Division Facts**		Math Forum Library

Mathematics - Grade 4: Introduction

In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

1. Students generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place. They apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Depending on the numbers and the context, they select and accurately apply appropriate methods to estimate or mentally calculate products. They develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems. Students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends. They select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context.

2. Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and they develop methods for generating and recognizing equivalent fractions. Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.

3. Students describe, analyze, compare, and classify two-dimensional shapes. Through building, drawing, and analyzing two-dimensional shapes, students deepen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry.

Grade 4 Overview

Operations and Algebraic Thinking
- Use the four operations with whole numbers to solve problems.
- Gain familiarity with factors and multiples.
- Generate and analyze patterns.

Number and Operations in Base Ten
- Generalize place value understanding for multidigit whole numbers.
- Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions
- Extend understanding of fraction equivalence and ordering.
- Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

Understand decimal notation for fractions, and compare decimal fractions.

Measurement and Data
- Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
- Represent and interpret data.
- Geometric measurement: understand concepts of angle and measure angles.

Geometry
- Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

Mathematics – Fourth Grade Common Core Learning Standards

Operations & Algebraic Thinking 4.OA	Example
Use the four operations with whole numbers to solve problems.	
• Understand that a multiplication equation is verbally stated as a comparison of two factors that are communative. (4.OA.1)	Interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5.
• Solve word problems using multiplication and division by using drawings and algebraic equations. (4.OA.2)	There are 26 diamond rings for sale at a jewelry store. Each ring costs $577.00. How much would it cost to buy all 26 rings? (26 x $577 = d)
• Compare a multiplication equation to an addition equation. (4.OA.2)	There are 56 books. Each student receives 7 books. How many students received books? (56 = 7s)
• Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations. (4.OA.3)	3 x 5 = 3+3+3+3+3
• Interpret word problems that have remainders. (4.OA.3)	
• Assess the reasonableness of answers using mental computation, estimation strategies, and compatible numbers. (4.OA.3)	
Gain familiarity with factors and multiples.	
• Find all factor pairs for a whole number between 1–100. (4.OA.4)	
• Become familiar with the relationship between factors and multiples. (4.OA.4)	
• Determine whether a given whole number between 1–100 is a multiple of a given one-digit number. (4.OA.4)	18 is a multiple of 1, 2, 3, 6, 9, 18 1, 2, 3, 6, 9, 19 are factors of 18
• Determine whether a given whole number between 1–100 is prime or composite. (4.OA.4)	

Generate and analyze patterns. • Generate a number pattern that follows a given rule (table, input-output box). (4.OA.5) • Generate a shape pattern that follows a given rule. (4.OA.5) • Identify apparent features of the pattern that were not explicit in the rule itself (including odd even properties of all operations, multiples, all are factors of the greatest output). (4.OA.5)	Given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain the odd even property of addition.

Operations & Algebraic Thinking Vocabulary

addition/add composite division/Divide equations estimation factor	factor pairs mental computation multiple multiplication/Multiply pattern (number or shape) pattern rule	prime reasonableness remainders rounding subtraction/subtract unknown

Number & Operations In Base Ten 4.NBT	Example
Generalize place value understanding for multi-digit whole numbers. • Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. (4.NBT.1) • Read and write multi-digit whole numbers using base-ten numerals to 1,000,000. (4.NBT.2) • Read and write number using standard and expanded form to 1,000,000. (4.NBT.2) • Compare two multi-digit numbers using the place value of each digit. Use the correct symbol, >, =, and <, to represent the comparison. (4.NBT.2) • Use place value understanding to round multi-digit whole numbers to any place. (4.NBT.3) **Use place value understanding and properties of operations to perform multi-digit arithmetic.** • Fluently add and subtract multi-digit whole numbers using the standard algorithm. (4.NBT.4) • Multiply a whole number of up to four digits by a one-digit whole number using partial products, rectangular arrays, and/or area models. (4.NBT.5) • Multiply a two-digit whole number by a two-digit number using partial products, rectangular arrays, and/or area models. (4.NBT.5) • Divide a four-digit number by a one-digit divisor, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. (4.NBT.6) • Illustrate and explain the division calculation by using equations, rectangular arrays, and/or area models. (4.NBT.6)	544 the 4 in the tens place is 10 times more than the 4 in the ones place 35 x 42 = (2 x 5) + (2 x 30) + (40 x 5) + (40 x 30)

Number & Operations In Base Ten Vocabulary		
<, >, = benchmark fraction comparisons/compare denominator equal to equivalent	fraction greater than less than multiple numerator	partition place value reason round unit fraction

Numbers and Operations / Fractions	4.NF	Example

Extend understanding of fraction equivalence and ordering. • Find equivalent fractions by multiplying numerator and denominator by the same number and explain why they are equivalent using visual models with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. (4.NF.1) • Compare two fractions with different numerators and different denominators (4.NF.2) a. by creating common denominators or observing common numerators b. by comparing to a benchmark fraction such as 1/2, 1/3, 1/4 • Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions (4.NF.2)	1/2 of a baseball is not the same as 1/2 of a basketball
Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. • Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. (4.NF.3) a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.	3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 and 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.

d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.	
• Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. (4.NF.4) a. Understand a fraction *a*/*b* as a multiple of the unit fraction 1/*b*. Ex. 5/4 = 5 x (1/4)	Use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).
b. Understand a multiple of *a/b* as a multiple of the unit fraction *1/b*, and use this understanding to multiply a fraction by a whole number. Ex. 2/5 is 2 x (1/5) and when multiplied by a whole number such as 3 it would be 3 x (2/5) = (3 x 2)(1/5)	Use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b)
c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations.	If each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?
Understand decimal notation for fractions, and compare decimal fractions. • Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions unlike denominators. (4.NF.5)	
• Use decimal notation for fractions with denominators 10 or 100. (4.NF.6)	Express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.
• Compare two decimals to hundredths by reasoning about their size as long as it refers to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model. (4.NF.7)	Rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.

_____ 1 Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, 100. 2 Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.	

Numbers and Operations / Fractions Vocabulary		
Vocabulary <, >, = Addition/joining benchmark fractions Comparison/compare Decimals Decomposing Denominator	Equivalent Fraction Hundredths Mixed number Multiple Multiply Numerator	Operations Partition Properties (rules) Reason/reasoning Subtraction/separating Tenths Unit fraction

Measurement and Data **4.MD**	**Example**
Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. • Know relative sizes of measurement units within one system including km, m, cm; mi, yd, ft, in. (4.MD.1) • Know relative sizes of measurement units within one system including kg, g; lb, oz. (4.MD.1) • Know relative sizes of measurement units within one system including l, ml; gal, qt, pt, c. (4.MD.1) • Know relative sizes of measurement units within one system including hr, min, sec. (4.MD.1) • Convert measurement in a single system. Record measurement equivalents in a two-column table. (4.MD.1)	Know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...
• Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money. (4.MD.2) • Include problems involving simple fractions or decimals, and conversion. (4.MD.2) • Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (4.MD.2) • Apply the area and perimeter formulas for rectangles in real world and mathematical problems. (4.MD.3)	Find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor. From a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.

Represent and interpret data. • Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. (4.MD.4) **Geometric measurement: understand concepts of angle and measure angles.** • Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: (4.MD.5) • a. Measure an angle within a circle (1/360 of a circle is called a 1 degree angle). b. Each angle is a multiple of a one degree angle. • Measure angles in whole-number degrees using a protractor. Draw angles of specified measure. (4.MD.6) • Find measurements of missing angles using an equation with a symbol for the unknown angle measure. (4.MD.7)	Line plot

Measurement and Data Vocabulary		
Area Centimeter (cm) Convert/conversion Cup (c) Customary Data Distance Equivalent Foot (ft) Gallon (gal) Gram (g) Hour Inch (in)	Kilogram (kg) Kilometer (km) Length Length Line plot Liquid volume Liter (L) Mass Measure Meter (m) Metric Mile (mi) Milliliter (mL)	Minute Operations Ounce (oz) Perimeter Pint (pt) Pound (lb) Quarter (qt) Relative size Second Time Yard (yd)

Geometry 4.G	Example
Draw and identify lines and angles, and classify shapes by properties of their lines and angles. • Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4.G.1) • 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. (4.G.2) • Recognize right triangles as a category, and identify right triangles. (4.G.2) • 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. (4.G.3)	

Geometry Vocabulary		
Acute angle	Identify	Rectangle
Angles	Isosceles	Rhombi
Circle	Line of symmetry	Rhombus
Classify	Line segments	Right angle
Cone	Lines	Scalene
Cube	Obtuse angle	Sphere
Cylinder	One-degree angle	Square
Decomposed	Parallel	Symmetry
Draw	Pentagon	Trapezoid
Endpoint	Perpendicular	Triangle
Equilateral triangle	Point	Two dimensional figure
Geometric shapes	Protractor	Vertex/Vertices
Half/quarter circle	Quadrilateral	
Hexagon	Rays	

Grade Four Pacing Guide	September	Resources
Number & Operations in Base Ten • Read and write multi-digit whole numbers using base-ten numerals to 1,000,000. (4.NBT.2) • Read and write numbers using standard and expanded form to 1,000,000. (4.NBT.2) • Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. (4.NBT.1) • Compare two multi-digit numbers using the place value of each digit. Use the correct symbol, >, =, and <, to represent the comparison. (4.NBT.2) • Use place value understanding to round multi-digit whole numbers to any place. (4.NBT.3) • Fluently add and subtract multi-digit whole numbers using the standard algorithm. (4.NBT.4)		***Literature*** *How Much is a Million?* By David M. Schwartz

Grade Four Pacing Guide	October	Resources
Operations & Algebraic Thinking • Compare a multiplication equation to an addition equation. (4.OA.2) • Find all factor pairs for a whole number between 1–100. (4.OA.4) • Become familiar with the relationship between factors and multiples. (4.OA.4) • Understand that a multiplication equation is verbally stated as a comparison of two factors that are communative. (4.OA.1) • Determine whether a given whole number between 1–100 is a multiple of a given one-digit number. (4.OA.4) • Determine whether a given whole number between 1–100 is prime or composite. (4.OA.4) **Number & Operations in Base Ten** • Multiply a whole number of up to four digits by a one-digit whole number using partial products, rectangular arrays, and/or area models. (4.NBT.5) • Multiply a two-digit whole number by a two-digit number using partial products, rectangular arrays, and/or area models. (4.NBT.5) • Divide a four-digit number by a one-digit divisor, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. (4.NBT.6) **Operations & Algebraic Thinking** • Interpret word problems that have remainders. (4.OA.3) **Number & Operations in Base Ten** • Illustrate and explain the division calculation by using equations, rectangular arrays, and/or area models. (4.NBT.6)		***Online Resources*** Factor Pairs Game; Factor Bingo Game (Board A & B, Board C & D, Cards) Multiple Turn Over Game (Recording Sheet, Cards) Factor Captor Partial Products Videos; Dynamic Paper Partial Quotients Video See Partial Quotients Document on Math Common Core Eboard under Resources and click on Long Division Practice Dynamic Paper

Grade 4 Pacing Guide October (Continued) **Operations & Algebraic Thinking** • Solve word problems using multiplication and division by using drawings and algebraic equations. (4.OA.2) • Assess the reasonableness of answers using mental computation, estimation strategies, and compatible numbers. (4.OA.3) • Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations. (4.OA.3)	Algebraic Thinking Word Problems

Grade Four Pacing Guide	November	Resources
Operations & Algebraic Thinking • Generate a number pattern that follows a given rule (table, input-output box). (4.OA.5) • Generate a shape pattern that follows a given rule. (4.OA.5) • Identify apparent features of the pattern that were not explicit in the rule itself (including odd even properties of all operations, multiples, all are factors of the greatest output). (4.OA.5) **Numbers and Operations/Fractions** • Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. (4.NF.3) e. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. f. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. g. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. h. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. • Find equivalent fractions by multiplying numerator and denominator by the same number and explain why they are equivalent using visual models with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. (4.NF.1)		***Teacher Resource*** *Groundworks Grade 4* ***Online Resources*** Dynamic Paper Function Machine Fraction Models; Visual Fractions Dynamic Paper

• Compare two fractions with different numerators and different denominators (4.NF.2)
 	
Grade 4 Pacing Guide November (Continued)
 	
  • by creating common denominators or observing common numerators (4.NF.2a)
 	
  • by comparing to a benchmark fraction such as 1/2, 1/3, 1/4 (4.NF.2b)
 	
• Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions. (4.NF.2)
	Fraction Bars
	
	Dynamic Paper

Grade Four Pacing Guide	December	Resources
Numbers and Operations/Fractions • Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. (4.NF.4) ○ Understand a fraction *a*/*b* as a multiple of the unit fraction 1/*b*. Ex. 5/4 = 5 x (1/4) ○ Understand a multiple of *a/b* as a multiple of the unit fraction *1/b*, and use this understanding to multiply a fraction by a whole number. Ex. 2/5 is 2 x (1/5) and when multiplied by a whole number such as 3 it would be 3 x (2/5) = (3 x 2)(1/5) ○ Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations.		***Online Resources*** Fraction Models Visual Fractions

Grade Four Pacing Guide	January	Resources
Numbers and Operations/Fractions • Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions unlike denominators. (4.NF.5) • Use decimal notation for fractions with denominators 10 or 100. (4.NF.6) • Compare two decimals to hundredths by reasoning about their size as long as it refers to the same whole. (4.NF.7) • Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model. (4.NF.7)		***Online Resources*** Fraction Decimal Conversion Dynamic Paper Decimal Squares Games

Grade Four Pacing Guide	February	Resources
Geometry • Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4.G.1) • 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. (4.G.2) • Recognize right triangles as a category, and identify right triangles. (4.G.2) • 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. (4G.3) • Identify line-symmetric figures and draw lines of symmetry. (4G.3)		***Online Resources*** Dynamic Paper Virtual Geoboard Line of Symmetry Video

Grade Four Pacing Guide	March	Resources

Measurement and Data
• Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: (4.MD.5)
  o Measure an angle within a circle (1/360 of a circle is called a 1 degree angle).
  o Each angle is a multiple of a one-degree angle.
• Measure angles in whole-number degrees using a protractor. Draw angles of specified measure. (4.MD.6)
• Find measurements of missing angles using an equation with a symbol for the unknown angle measure. (4.MD.7)
• Know relative sizes of measurement units within one system including km, m, cm; mi, yd, ft, in. (4.MD.1)
• Know relative sizes of measurement units within one system including kg, g; lb, oz. (4.MD.1)
• Know relative sizes of measurement units within one system including l, ml; gal, qt, pt, c. (4.MD.1)
• Know relative sizes of measurement units within one system including hr, min, sec. (4.MD.1)
• Convert measurement in a single system. Record measurement equivalents in a two-column table. (4.MD.1)
• Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money. (4.MD.2)
• Include problems involving simple fractions or decimals, and conversion. (4.MD.2)
		Online Resources
		Angles and Protractors
		Measurement Conversions

• Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (4.MD.2) • Apply the area and perimeter formulas for rectangles in real world and mathematical problems. (4.MD.3)	Area & Perimeter Explorer

Grade Four Pacing Guide	April	Resources
Measurement and Data • Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. (4.MD.4) **Review & Test Prep**		

Grade Four Pacing Guide	May	Resources
Math Extension Projects based on curriculum		***Online Resources*** Math Extension Ideas Banks Decimals to thousandths

Grade Four Pacing Guide	June	Resources
Review of math concepts and preview 5th grade concepts **4th grade End of Year Assessment**		

Mathematics - Grade 5: Introduction

In Grade 5, instructional time should focus on three critical areas: (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume.

1. Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them. Students also use the meaning of fractions, of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense. (Note: this is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.)

2. Students develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations. They finalize fluency with multi-digit addition, subtraction, multiplication, and division. They apply their understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations, and make reasonable estimates of their results. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths efficiently and accurately.

1. Students recognize volume as an attribute of three-dimensional space. They understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps. They understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. They select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume. They decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes. They measure necessary attributes of shapes in order to determine volumes to solve real world and mathematical problems.

Grade 5 Overview

Operations and Algebraic Thinking
- Write and interpret numerical expressions.
- Analyze patterns and relationships.

Number and Operations in Base Ten
- Understand the place value system.
- Perform operations with multi-digit whole numbers and with decimals to hundredths.

Number and Operations—Fractions
- Use equivalent fractions as a strategy to add and subtract fractions.
- Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Measurement and Data
- Convert like measurement units within a given measurement system.
- Represent and interpret data.
- Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

Geometry
- Graph points on the coordinate plane to solve real-world and mathematical problems.
- Classify two-dimensional figures into categories based on their properties.

Mathematics – Fifth Grade Common Core Learning Standards

Operations and Algebraic Thinking 5.OA	**Examples**
Write and interpret numerical expressions. ▪ Use parentheses, brackets, or braces in numerical expressions (5.OA 1) ▪ Evaluate expressions with parentheses, brackets, or braces (5.OA 1) ▪ Write simple expressions that record calculations with numbers (5.OA 2) ▪ Interpret numerical expressions without evaluating them (5. OA 2)	*Express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7).* *Recognize that 3 × (12 + 20) is three times as large as 12 + 20*
Analyze patterns and relationships. ▪ Generate two numerical patterns using two given rules (5.OA 3) ▪ Identify relationships between corresponding terms in two numerical patterns (5.OA 3) ▪ Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane (5.OA 3)	*Given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences. (0, 3, 6, 9, ... and 0, 6, 12, 18, ...)* *Observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.* *Graph the ordered pairs (0,0), (3,6), (6,12)…*

Operations and Algebraic Thinking Vocabulary		
Analyze Braces Brackets Coordinate plane Corresponding Evaluate	Expressions Generate Interpret Numerical expressions Numerical patterns Ordered pairs	Parentheses Patterns Relationships Rules Sequence Terms

Number and Operations in Base Ten 5.NBT	**Example**
Understand the place value system. ▪ Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left (5.NBT 1) ▪ Explain patterns in the number of zeros of the product when multiplying a number by powers of 10 (5.NBT 2) ▪ Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10 (5.NBT 2) ▪ Use whole-number exponents to denote powers of 10. (5.NBT 2)	*In 777, the 7 in the tens place is 10 times more than the 7 in the ones place.* *$34 \times 10^2 = 3{,}400$* *In 3.4 x 10 = 34, the decimal moves one place to the right for each zero. In 3.4 / 10 = 0.34, the decimal moves one place to the left for each zero.*

▪ Read, write, and compare decimals to thousandths (5.NBT 3) ▪ Read and write decimals to thousandths using base-ten numerals, number names, and expanded form (5.NBT 3) ▪ Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < (5.NBT 3) ▪ Use place value understanding to round decimals to any place (5. NBT 4)	*347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × 0.1 + 9 × 0.01 + 2 × 0.001*
Perform operations with multi-digit whole numbers and with decimals to hundredths. ▪ Fluently multiply multi-digit whole numbers using the standard algorithm (5.NBT 5) ▪ Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division (5.NBT 6) ▪ Illustrate and explain calculations by using equations, rectangular arrays, and/or area models (5. NMT 6) ▪ Add, subtract, multiply, and divide decimals to hundredths. Solve and explain using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction (5. NBT 7)	*347 x 56 =19,432*

Number and Operations in Base Ten Vocabulary		
Add Addition Algorithm Area models Base ten numerals Calculations Compare Comparison Decimal Decimal Point Denote difference Digits Divide Dividends	Division Divisor Equal to = Equations Expanded form Exponents Greater than > Hundredths Less than < Multi-digit Multiplication Multiply Patterns Place Value Power of 10	Products Properties Quotients Reasoning Rectangular Array Round Rules Standard form Subtract Subtraction Sum Tenths Thousandths Times Word form

Numbers & Operations Fractions **5.NF**	**Examples**
Use equivalent fractions as a strategy to add and subtract fractions. ▪ Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions with like denominators. (5.NF 1)	*2/3 + 5/4 = 8/12 + 15/12 = 23/12*
▪ Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem (5.NF 2)	*Billy ate 1/3 of the pie. His brother ate 3/6 of the pie. How much of the pie is left?*
▪ Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers (5. NF 2)	*For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*
Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	
▪ Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. (5. NF 4)	
a. Interpret the product (*a*/*b*) x *q* as a parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a x q ÷ b*. (5. NF 4)	*For example, use a visual fraction model to show (2/3) x 4 = 8/3, and create a story context for this equation. Do the same with (2/3) x (4/5) = 8/15. (In general, (a/b) x (c/d) =ac/bd.)*
b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. (5. NF 4)	*Find the area of a rectangle with sides 3 ½ units by 6 ¼*

▪ Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$) (5. NF 3)	*For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4.*
▪ Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. (5. NF 3)	*If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*
▪ Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication (5. NF 5) b. Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case) (5. NF 5) c. Explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number (5. NF 5) d. Relate the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1 (5. NF 5)	9 x 10 is greater than 9 x 9 *2/5 x 4/4 = 8/20 where 4/4 is equivalent to one whole*
▪ Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. (5. NF 6)	

▪ Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. *Footnote: Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. <u>But division of a fraction by a fraction is not a requirement</u>. (5. NF 7)* a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. (5. NF 7) b. Interpret division of a whole number by a unit fraction, and compute such quotients (5. NF 7) c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions (5. NF 7)	*Create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) x 4 = 1/3.* *Create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 x (1/5) = 4* *How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?* *Use visual fraction models and equations to represent the problem.*

Numbers & Operations Fractions Vocabulary		
Fraction Equivalent fraction Numerator Denominator Part Unlike denominator Benchmark fraction	Estimate Reasonableness Mixed number Operations Partition Equal parts Equivalent	Factor Unit fraction Area Side lengths Fractional sides lengths Scaling Comparing

Measurement & Data **5.MD**	**Example**
Convert like measurement units within a given measurement system. ▪ Convert among different-sized standard measurement units within a given measurement system and use these conversions in solving multi-step, real world problems. (5. MD 1) **Represent and interpret data.** ▪ Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. (5. MD 2) **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.** ▪ Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5. MD 3) ▪ Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < (5.NBT 3) a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. (5. MD 3) b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units. (5. MD 3) ▪ Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5. MD 4)	*Convert 5cm to 0.05 m*

▪ Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. (5. MD 5) a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying $V = l \times w \times h$ and $V = b \times h$ *(5. MD 5)* b. Represent threefold whole-number products as volumes (5. MD 5) c. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems. (5. MD 5) d. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems. (5. MD 5)	Create a line plot using measurements involving fractions (i.e. 4 ½ cm, 3 ¼ cm, 1 ½ cm, 5 cm, etc.) *347 x 56 =19,432* *Represent the associative and commutative property of multiplication*

Measurement & Data Vocabulary		
Area of base		
Attribute	Height	Milliliter (mL)
Centimeter (cm)	Hour	Minute
Composite	Inch (in)	Ounce (oz)
Conversion	Kilogram (kg)	Overlap
Convert	Kilometer (km)	Pint (p)
Cubic units	Length	Pound (lb)
Cup (c)	Length	Quart (qt)
Customary measurement	Line plot	Relative size
Dimensions	Liquid volume	Right rectangular prism
Edge lengths	Liter (L)	Second
Foot (ft)	Mass	Solid figure
Gallon (gal)	Measurement units	Unit cube
Gap	Measurement system	Units
Geometry	Meter (m)	Volume
Gram (g)	Metric system	Yard (yd)

Geometry **5G**	**Example**
Graph points on the coordinate plane to solve real-world and mathematical problems. ▪ Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line (5. G 1) ▪ Graph a point in the plane located by using an ordered pair of numbers, called its coordinates. (5. G 1) ▪ Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). (5. G 1) ▪ Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5. G 2) **Classify two-dimensional figures into categories based on their properties.** ▪ Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. (5. G 3) ▪ Classify two-dimensional figures in a hierarchy based on properties. (5. G 4)	*All rectangles have four right angles and squares are rectangles, so all squares have four right angles.*

Geometry Vocabulary		
Attributes Axis/axes Category Circle Classify Coincide Coordinate plane Coordinate system Coordinate values Coordinates Cube First quadrant Graphs Half/quarter circle	Hexagon Hierarchy Horizontal Intersection of lines Lines Number line Ordered pairs Origin Pentagon Perpendicular Points Polygon Properties Quadrilateral	Rectangle Rhombus/rhombi Rules Square Subcategory Trapezoid Triangle Two-dimensional Vertical x-axis x-coordinate y-axis y-coordinate

Grade 5 Pacing Guide	September	Resources
Understand the place value system ▪ Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left (5.NBT 1) ▪ Use whole-number exponents to denote powers of 10. (5.NBT 2) ▪ Read, write, and compare decimals to thousandths (5.NBT 3) ▪ Read and write decimals to thousandths using base-ten numerals, number names, and expanded form (5.NBT 3) ▪ Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < (5.NBT 3) ▪ Use place value understanding to round decimals to any place (5. NBT 4) ▪ Solve real world problems involving whole numbers and decimals **Operations in Base Ten** ▪ Fluently add and subtract multi-digit whole numbers using the standard algorithm		***Teacher Resources*** Marilyn Burns *Developing Number Sense* p. 47 "One Time Only" Marilyn Burns *A Collection of Math Lessons* 3 – 6 p. 129 "The Horse Problem" *Building on Numbers You Know (*TERC) ***Online Resources*** Base Ten Game Representing Decimals with Base Ten Blocks Representing Decimals in Different Ways Rounding Decimals to the Nearest Hundredths

Grade 5 Pacing Guide	October	Resources
Operations in Base Ten ▪ Fluently multiply multi-digit whole numbers using the standard algorithm. (5.NBT 5) ▪ Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division (5.NBT 6) ▪ Illustrate and explain calculations by using equations, rectangular arrays, and/or area models (5. NMT 6) ▪ Explain patterns in the number of zeros of the product when multiplying a number by powers of 10 (5.NBT 2) ▪ Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10 (5.NBT 2) ▪ Add, subtract, multiply, and divide decimals to hundredths. Solve and explain using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction (5. NBT 7)		***Teacher Resources*** *Building on Numbers You Know (*TERC) ***Online Resources*** Make the Largest Product Make the Smallest Product Whole Number x Power of Ten Decimal x Power of Ten Whole Number Divided by Power of Ten Decimal Divided by a Power of Ten Total Ten Decimal Subtraction Spin Decimal Addition to 500 Decimal Addition Bingo Decimal Race to Zero Decimal Magic Triangle Decimal Magic Square

Grade 5 Pacing Guide	November	Resources
Operations and Algebraic Thinking (numerical expressions) ▪ Understand the order of operations ▪ Write simple expressions that record calculations with numbers (5.OA 2) ▪ Interpret numerical expressions without evaluating them (5. OA 2) ▪ Use parentheses, brackets, or braces in numerical expressions (5.OA 1) ▪ Evaluate expressions with parentheses, brackets, or braces (5.OA 1) ▪ Generate an algebraic expression/equation based on a word problem/real world situation **Operations and Algebraic Thinking (Analyze patterns and relationships)** ▪ Generate two numerical patterns using two given rules (5.OA 3) ▪ Identify relationships between corresponding terms in two numerical patterns (5.OA 3) ▪ Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane (5.OA 3)		***Online Resources*** Verbal Expressions Target Number Dash Order of Operations Function Table and Graph Template Function Table and Coordinate Graph Template Addition on the Coordinate Plane Subtraction on the Coordinate Plane

Grade 5 Pacing Guide	December	Resources
Number and Operations (addition and subtraction)/Fractions ▪ Apply and extend previous understandings of like fractions ▪ Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$) (5. NF 3) ▪ Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem (5.NF 2) ▪ Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers (5. NF 2) ▪ Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions with like denominators. (5.NF 1)		***Online Resources*** Magic Square Addition of Fractions Adding Mixed Numbers Subtracting with Mixed Numbers Add, Subtract, Multiply and Divide with Fractions Word Problems: Add and Subtract Fractions Word Problems: Add and Subtract Mixed Numbers Equivalent Fractions Add and Subtract Unlike Fractions Estimate Products of Mixed Numbers

Grade 5 Pacing Guide	January	Resources
Number and Operations (multiplication)/Fractions ▪ Apply and extend previous understandings of multiplication and division to multiply and divide fractions. ▪ Interpret the product (a/b) x q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. (5. NF 4) ▪ Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. (5. NF 4) ▪ Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. (5. NF 6) ▪ Interpret multiplication as scaling (resizing), by: o Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication (5. NF 5) o Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case) (5. NF 5) o Explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number (5. NF 5) o Relate the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1 (5. NF5)		***Online Resources*** Multiplication of Fractions Multiplying Fractions by Dividing Rectangles Word Problems: Fraction x Fraction Adjusting Recipes Word Problems: Fractions x Whole Numbers Input/Output: Fractions x Whole Numbers Word Problems: Fraction x Fraction Word Problems: Multiplication with Mixed Numbers

Grade 5 Pacing Guide	February	Resources
Number and Operations (Division)/Fractions ▪ Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. *Footnote: Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement. (5. NF 7)* ▪ Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. (5. NF 7) ▪ Interpret division of a whole number by a unit fraction, and compute such quotients (5. NF 7) ▪ Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions (5. NF 7)		***Online Resources*** Word Problems: Divide with Fractions Word Problems: Divide Fractions Recipes with Fractions

Grade 5 Pacing Guide	March	Resources
Measurement and Data (converting units/graphing) ▪ Convert among different-sized standard measurement units within a given measurement system and use these conversions in solving multi-step, real world problems. (5. MD 1) ▪ Represent and interpret data using various graphs ▪ Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. (5. MD 2) **Geometry (graphing)** ▪ Graph points on the coordinate plane to solve real-world and mathematical problems ▪ Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line (5. G 1) ▪ Graph a point in the plane located by using an ordered pair of numbers, called its coordinates. (5. G 1) ▪ Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). (5. G 1) ▪ Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5. G 2)		***Online Resources*** Comparing Units of Metric Linear Measure Metric Word Problems Fractions on a Line Plot Fractions on a Line Plot: Sacks of Flour Coordinate Grid Geoboards Geometric Shapes on the Coordinate Grid

Grade 5 Pacing Guide	April	Resources
Geometry (shapes) ▪ Classify two-dimensional figures into categories based on their properties. ▪ Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. (5. G 3) ▪ Classify two-dimensional figures in a hierarchy based on properties. (5. G 4)		***Online Resources*** Identifying Quadrilaterals Create Quadrilaterals Constructing Quadrilaterals Quadrilateral Tangram Challenge Quadrilateral Tree Diagram Identifying Shapes Quadrilateral Quest

Grade 5 Pacing Guide	May	Resources
Measurement and Data (volume) **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.** ▪ Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5. MD 3) ▪ A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. (5. MD 3) ▪ A solid figure, which can be packed without gaps or overlaps using *n* unit cubes, is said to have a volume of *n* cubic units. (5. MD 3) ▪ Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5. MD 4) ▪ Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. (5. MD 5) ▪ Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying $V = l \times w \times h$ and $V = b \times h$ *(5. MD 5)* ▪ Represent threefold whole-number products as volumes (5. MD 5) ▪ Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems. (5. MD 5) ▪ Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems. (5. MD 5)		***Online Resources*** Exploring Volume Build Rectangular Prisms with a Given Volume Order by Volume Roll a Rectangular Prism Design a Toy Box Design a Cereal Box Finding Volume

Grade 5 Pacing Guide	June	Resources
Review of Math concepts and preview of sixth grade concepts		

Glossary (Click for Common Core State Standards Glossary)

Table 1. Common addition and subtraction situations.[1]

	Result Unknown	Change Unknown	Start Unknown
Add to	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? 2 + 3 = ?	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? 2 + ? = 5	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? ? + 3 = 5
Take from	Five apples were on the table. I ate two apples. How many apples are on the table now? 5 – 2 = ?	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? 5 – ? = 3	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? ? – 2 = 3

	Total Unknown	Addend Unknown	Both Addends Unknown[2]
Put Together/ Take Apart[3]	Three red apples and two green apples are on the table. How many apples are on the table? 3 + 2 = ?	Five apples are on the table. Three are red and the rest are green. How many apples are green? 3 + ? = 5, 5 – 3 = ?	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? 5 = 0 + 5, 5 = 5 + 0 5 = 1 + 4, 5 = 4 + 1 5 = 2 + 3, 5 = 3 + 2

	Difference Unknown	Bigger Unknown	Smaller Unknown
Compare[4]	("How many more?" version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? ("How many fewer?" version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? 2 + ? = 5, 5 – 2 = ?	(Version with "more"): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? 2 + 3 = ?, 3 + 2 = ?	(Version with "more"): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? 5 – 3 = ?, ? + 3 = 5

[2]These take apart situations can be used to show all the decompositions of a given number. The associated equations, which have the total on the left of the equal sign, help children understand that the = sign does not always mean makes or results in but always does mean is the same number as.
[3]Either addend can be unknown, so there are three variations of these problem situations. Both Addends Unknown is a productive extension of this basic situation, especially for small numbers less than or equal to 10.
[4]For the Bigger Unknown or Smaller Unknown situations, one version directs the correct operation (the version using more for the bigger unknown and using less for the smaller unknown). The other versions are more difficult.

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[1]Adapted from Box 2-4 of Mathematics Learning in Early Childhood, National Research Council (2009, pp. 32, 33).

Table 2. Common multiplication and division situations.[1]

	Unknown Product 3 × 6 = ?	Group Size Unknown ("How many in each group?" Division) 3 × ? = 18, and 18 ÷ 3 = ?	Number of Groups Unknown ("How many groups?" Division) ? × 6 = 18, and 18 ÷ 6 = ?
Equal Groups	There are 3 bags with 6 plums in each bag. How many plums are there in all? *Measurement example*. You need 3 lengths of string, each 6 inches long. How much string will you need altogether?	If 18 plums are shared equally into 3 bags, then how many plums will be in each bag? *Measurement example*. You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?	If 18 plums are to be packed 6 to a bag, then how many bags are needed? *Measurement example*. You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?
Arrays,[2] Area[3]	There are 3 rows of apples with 6 apples in each row. How many apples are there? *Area example*. What is the area of a 3 cm by 6 cm rectangle?	If 18 apples are arranged into 3 equal rows, how many apples will be in each row? *Area example*. A rectangle has area 18 square centimeters. If one side is 3 cm long, how long is a side next to it?	If 18 apples are arranged into equal rows of 6 apples, how many rows will there be? *Area example*. A rectangle has area 18 square centimeters. If one side is 6 cm long, how long is a side next to it?
Compare	A blue hat costs $6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost? *Measurement example*. A rubber band is 6 cm long. How long will the rubber band be when it is stretched to be 3 times as long?	A red hat costs $18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost? *Measurement example*. A rubber band is stretched to be 18 cm long and that is 3 times as long as it was at first. How long was the rubber band at first?	A red hat costs $18 and a blue hat costs $6. How many times as much does the red hat cost as the blue hat? *Measurement example*. A rubber band was 6 cm long at first. Now it is stretched to be 18 cm long. How many times as long is the rubber band now as it was at first?
General	$a \times b = ?$	$a \times ? = p$, and $p \div a = ?$	$? \times b = p$, and $p \div b = ?$

[2]The language in the array examples shows the easiest form of array problems. A harder form is to use the terms rows and columns: The apples in the grocery window are in 3 rows and 6 columns. How many apples are in there? Both forms are valuable.
[3]Area involves arrays of squares that have been pushed together so that there are no gaps or overlaps, so array problems include these especially important measurement situations.

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[1]The first examples in each cell are examples of discrete things. These are easier for students and should be given before the measurement examples.

Table 3. The properties of operations. Here *a*, *b* and *c* stand for arbitrary numbers in a given number system. The properties of operations apply to the rational number system, the real number system, and the complex number system.

Associative property of addition	$(a + b) + c = a + (b + c)$
Commutative property of addition	$a + b = b + a$
Additive identity property of 0	$a + 0 = 0 + a = a$
Existence of additive inverses	For every a there exists $-a$ so that $a + (-a) = (-a) + a = 0$
Associative property of multiplication	$(a \times b) \times c = a \times (b \times c)$
Commutative property of multiplication	$a \times b = b \times a$
Multiplicative identity property of 1	$a \times 1 = 1 \times a = a$
Existence of multiplicative inverses	For every $a \neq 0$ there exists $1/a$ so that $a \times 1/a = 1/a \times a = 1$
Distributive property of multiplication over addition	$a \times (b + c) = a \times b + a \times c$

Table 4. The properties of equality. Here *a*, *b* and *c* stand for arbitrary numbers in the rational, real, or complex number systems.

Reflexive property of equality	$a = a$
Symmetric property of equality	If $a = b$, then $b = a$
Transitive property of equality	If $a = b$ and $b = c$, then $a = c$
Addition property of equality	If $a = b$, then $a + c = b + c$
Subtraction property of equality	If $a = b$, then $a - c = b - c$
Multiplication property of equality	If $a = b$, then $a \times c = b \times c$
Division property of equality	If $a = b$ and $c \neq 0$, then $a \div c = b \div c$
Substitution property of equality	If $a = b$, then b may be substituted for a in any expression containing a.

Table 5. The properties of inequality. Here *a*, *b* and *c* stand for arbitrary numbers in the rational or real number systems.

Exactly one of the following is true: $a < b$, $a = b$, $a > b$.
If $a > b$ and $b > c$ then $a > c$.
If $a > b$, then $b < a$.
If $a > b$, then $-a < -b$.
If $a > b$, then $a \pm c > b \pm c$.

If $a > b$ and $c > 0$, then $a \times c > b \times c$.
If $a > b$ and $c < 0$, then $a \times c < b \times c$.
If $a > b$ and $c > 0$, then $a \div c > b \div c$.
If $a > b$ and $c < 0$, then $a \div c < b \div c$.