

Core Knowledge Sequence Kindergarten	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
I. Patterns and Classification			
Establish concepts of likeness and difference by sorting and classifying objects according to various attributes: size, shape, color, amount, function, etc.	4	K.MD 3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.	
Define a set by the common property of its elements.	7	K.G. 4. 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).	
In a collection of objects that includes a given set and an item that does not belong, indicate which item does not belong.	2	K.MD 3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.	
Moving from concrete objects to pictorial representations, recognize patterns and predict the extension of a pattern.	7		4.OA 5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. <i>For example, 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 informally why the numbers will continue to alternate in this way.</i>
Extend a sequence of ordered concrete objects.	1, 7		
II. Numbers and Number Sense			
Using concrete objects and pictorial representations, compare sets: same as (equal to) more than less than most least	4	K.CC 6. 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. K.OA 3. 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 (e.g., $5 = 2 + 3$ and $5 = 4 + 1$).	
Count			

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forward from 1 to 31, first beginning with 1, and later from any given number	2	<p>K.CC 1. Count to 100 by ones and by tens.</p> <p>K.CC 2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1).</p>	
backward from 10	2		
from 1 to 10 by twos	2		
by fives and tens to 50	2	<p>K.CC 1. Count to 100 by ones and by tens.</p>	
Write numbers 1 to 31 (with special attention to the difference between certain written symbols, such as 6 and 9; 2 and 5; 1 and 7; 12 and 21, etc.).	2	<p>K.CC 3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).</p>	
Count and write the number of objects in a set.	2	<p>K.CC 3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).</p> <p>K.CC 4. Understand the relationship between numbers and quantities; connect counting to cardinality.</p> <p>a. 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.</p> <p>b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.</p> <p>c. Understand that each successive number name refers to a quantity that is one larger.</p> <p>K.CC 5. 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; given a number from 1–20, count out that many objects.</p>	
Given a number, identify one more, one less.	2	<p>K.OA 1. Represent addition and subtraction with objects, fingers, mental images, drawings², sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.</p>	
Identify ordinal position, first (1st) through sixth (6th).	2		

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Identify pairs.	2		
Interpret simple pictorial graphs.	4		2.MD 10. 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 problems ⁴ using information presented in a bar graph.
Identify $\frac{1}{2}$ as one of two equal parts of a region or object; find $\frac{1}{2}$ of a set of concrete objects.	2, 7		3.NF 1. Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$.
III. Money			
Identify pennies, nickels, dimes, and quarters.	2		
Identify the one-dollar bill.	2		
Identify the dollar sign (\$) and cents sign (¢).	2		
Write money amounts using the cents sign (¢).	2		
IV. Computation			
Add and subtract to ten, using concrete objects; Recognize the meaning of the plus sign (+).	6	<p>K.OA 1. Represent addition and subtraction with objects, fingers, mental images, drawings², sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.</p> <p>K.OA 2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem</p> <p>K.OA 4. For any number 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.</p>	
Subtraction: the concept of “taking away”; recognize the meaning of the minus sign (-).	6	<p>K.OA 1. Represent addition and subtraction with objects, fingers, mental images, drawings², sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.</p> <p>K.OA 2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem</p>	

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V. Measurement			
Identify familiar instruments of measurement, such as ruler, scale, thermometer.	5,6		
Compare objects according to: Linear measure long and short; longer than, shorter than measure length using non-standard units begin to measure length in inches height: taller than, shorter than Weight heavy, light heavier than, lighter than Capacity (volume) full and empty less full than, as full as, fuller than Temperature: hotter and colder	4,5,6	K. MD 1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. K. MD 2. 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. For example, directly compare the heights of two children and describe one child as taller/shorter.	
Time Sequence events: before and after; first, next, last. Compare duration of events: which takes more or less time. <i>Read a clock face and tell time to the hour.</i> Know the days of the week and the months of the year. Orientation in time: today, yesterday, tomorrow; morning, afternoon; this morning vs. yesterday morning, etc.	4,5,6		1. MD. 3. Tell and write time in hours and half-hours using analog and digital clocks.
VI. Geometry			
Identify left and right hand.	2		
Identify top, bottom, middle.	2		

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<p>Know and use terms of orientation and relative position, such as:</p> <ul style="list-style-type: none"> closed, open on, under, over in front, in back (behind) between, in the middle of next to, beside inside, outside around far from, near above, below to the right of, to the left of here, there 	4	<p>K.G 1. 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.</p>	
<p>Identify basic shapes in a variety of common objects and artifacts (windows, pictures, books, buildings, cars, etc.).</p>	4	<p>K.G 2. Correctly name shapes regardless of their orientations or overall size.</p>	
<p>Identify and sort basic plane figures: square, rectangle, triangle, circle.</p>	4	<p>K.G 2. Correctly name shapes regardless of their orientations or overall size.</p> <p>K. G 3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three dimensional (“solid”).</p>	
<p>Recognize shapes as the same or different.</p>	4	<p>K.G 4. 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).</p>	
<p>Make congruent shapes and designs.</p>	4	<p>K. G 5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.</p> <p>K.G 6. Compose simple shapes to form larger shapes. For example, “Can you join these two triangles with full sides touching to make a rectangle?”</p>	

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Core Knowledge Sequence Grade 1	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
I. Patterns and Classification			
Establish concepts of likeness and difference by sorting and classifying objects according to various attributes: size, shape, color, amount, function, etc.	4		K.MD 33. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count. K.G. 4. 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).
Define a set by the common property of its elements.	2		K.MD 3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.
In a collection of objects that includes a given set and an item that does not belong, indicate which item does not belong.	2		K.MD 3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.
Recognize patterns and predict the extension of a pattern.	7		4.OA 5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. <i>For example, 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 informally why the numbers will continue to alternate in this way.</i>
II. Numbers and Number Sense			
Write numbers 0-100	2	1.NBT 1. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.	
Count from 0 - 100 by ones; twos; fives; tens.	2	1.NBT 1. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.	

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Count forward and backwards.	2	1.NBT 1. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.	
Use tallies.	4		
Identify ordinal position, 1st to 10th.	2		
Identify dozen; half-dozen; pair.	2		
Recognize place value: ones, tens, hundreds.	6	<p>1.NBT 2. Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:</p> <ul style="list-style-type: none"> a. 10 can be thought of as a bundle of ten ones — called a “ten.” b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. c. 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). 	<p>K.NBT 1. 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 (e.g., $18 = 10 + 8$); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.</p> <p>2.NBT 1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:</p> <ul style="list-style-type: none"> a. 100 can be thought of as a bundle of ten tens — called a “hundred.” 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).
Identify more and less; counting how many more or less.	6		K.MD 2 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. For example, directly compare the heights of two children and describe one child as taller/shorter.
Given a number, identify one more and one less; ten more and ten less.	6, 8	1.NBT 5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.	
Compare quantities using the signs <, >, and = .	2	1.NBT 3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.	K.CC 7. Compare two numbers between 1 and 10 presented as written numerals.

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Recognize fractions as part of a whole: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$	2	1.G.3. Partition circles and rectangles into two and four equal shares, describe 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.	3.NF 1. Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$. 3.G 2. 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 $\frac{1}{4}$ of the area of the shape.
Create and interpret simple pictorial graphs and bar graphs.	4	1.MD 4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.	2. MD 10. 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 problems ⁴ using information presented in a bar graph.
III. Money			
Identify and recognize relative value of penny, nickel, dime, quarter.	2		
Recognize and use dollar (\$) and cents (¢) signs.	2		
Show how different combinations of coins equal the same amounts of money.	7,8		
IV. Computation			
Addition(using concrete objects, and paper and pencil)			
Know the meaning of the plus (+) sign.	2		
Know what a “sum” is.	2		
Know addition facts to $10 + 10$ (untimed mastery).	6,7,8	1.OA 6. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. 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 $12 - 8 = 4$); and creating equivalent but easier or known sums (e.g., adding $6 + 7$ by creating the known equivalent $6 + 6 + 1 = 12 + 1 = 13$).	K.OA 4. 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 5. Fluently add and subtract within 5.

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Add in any order.	6,7,8	1.OA 6. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. 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 $12 - 8 = 4$); and creating equivalent but easier or known sums (e.g., adding $6 + 7$ by creating the known equivalent $6 + 6 + 1 = 12 + 1 = 13$).	
Know what happens when you add zero.	6,7,8		
Know how to write addition problems horizontally and vertically.	6,7,8		
Know that when you add 3 numbers, you get the same sum regardless of grouping of addends.	6,7,8	1.OA 2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.	
Solve two-digit addition problems with and without regrouping.	6,7,8	1.NBT 4. Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, 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.	
Subtraction (using concrete objects, and paper and pencil)			
Understand subtraction as “taking away.”	6,7,8	1.OA 5. 5. Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).	
Know the meaning of the minus sign (-).	2		
Know what a “difference” is.	2		

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Know subtraction facts corresponding to addition facts (untimed mastery).	6,7,8	<p>1.OA 4. Understand subtraction as an unknown-addend problem. For example, subtract $10 - 8$ by finding the number that makes 10 when added to 8.</p> <p>1.OA 6. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. 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 $12 - 8 = 4$); and creating equivalent but easier or known sums (e.g., adding $6 + 7$ by creating the known equivalent $6 + 6 + 1 = 12 + 1 = 13$).</p>	K.OA 5. Fluently add and subtract within 5.
Know how to write subtraction problems horizontally and vertically.	6,7,8		
Solve two-digit subtraction problems with and without regrouping.	6,7,8	<p>1.NBT 4. Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, 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.</p>	
Mentally subtract 10 from a two-digit number.	6,7,8	<p>1.NBT 5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.</p> <p>1.NBT 6. Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (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; relate the strategy to a written method and explain the reasoning used.</p>	
Solving Problems and Equations			

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Write an addition or subtraction equation to solve basic one-step story and picture problems.	4,6,7,8	1.OA 1. Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.	
Solve simple equations in the form of $___ - 2 = 7$; $5 + ___ = 7$.	6,7,8	<p>1.OA 3. Apply properties of operations as strategies to add and subtract.3 Examples: If $8 + 3 = 11$ is known, then $3 + 8 = 11$ is also known. (Commutative property of addition.) To add $2 + 6 + 4$, the second two numbers can be added to make a ten, so $2 + 6 + 4 = 2 + 10 = 12$. (Associative property of addition.)</p> <p>1.OA 7. Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false? $6 = 6$, $7 = 8 - 1$, $5 + 2 = 2 + 5$, $4 + 1 = 5 + 2$.</p> <p>1.OA 8. Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 + ? = 11$, $5 = ___ - 3$, $6 + 6 = ___$.</p>	
V. Measurement			
Identify familiar instruments of measurement, such as ruler, scale, thermometer.	5,6		

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<p>Compare objects according to:</p> <p>Linear measure</p> <p>Measure length using non-standard units.</p> <p>Measure length in inches and feet, and in centimeters.</p> <p>Measure and draw line segments in inches and centimeters.</p> <p>Weight</p> <p>Compare weights of objects using a balance scale.</p> <p>Measure weight in non-standard units and in pounds.</p> <p>Capacity (volume)</p> <p>Estimate and measure capacity in cups.</p> <p>Identify quart, gallon.</p> <p>Temperature: associate temperature in degrees Fahrenheit with weather.</p>	<p>4,5,6</p>	<p>1.MD 1. Order three objects by length; compare the lengths of two objects indirectly by using a third object.</p> <p>1.MD 2. Express the length of an object as a whole number of length units, 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.</p>	<p>K.MD 1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.</p> <p>2.MD 2. Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.</p> <p>3.MD 2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).6 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.</p>
<p>Time</p> <p>Sequence events: before and after; first, next, last.</p> <p>Compare duration of events: which takes more or less time.</p> <p>Read a clock face and tell time to the half-hour.</p> <p>Know the days of the week and the months of the year, both in order and out of sequence.</p> <p>Orientation in time: today, yesterday, tomorrow; morning, afternoon, evening, night; this morning vs. yesterday morning, etc.</p>	<p>4,5,6</p>	<p>1.MD 3. Tell and write time in hours and half-hours using analog and digital clocks.</p>	
VI. Geometry			
<p>Identify left and right hand.</p>	<p>2</p>		

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Identify top, bottom, middle.	2		
Know and use terms of orientation and relative position, such as: closed, open on, under, over in front, in back (behind) between, in the middle of next to, beside inside, outside around far from, near above, below to the right of, to the left of here, there	2	1.G1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.	
Identify and draw basic plane figures: square, rectangle, triangle, circle.	5		K.G 3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).
Describe square, rectangle, triangle according to number of sides.	1,2	1.G1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.	
Identify basic solid figures: sphere, cube, cone.	1		K.G 3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).
Identify basic shapes in a variety of common objects and artifacts (balls, cans, windows, pictures, books, buildings, cars, etc.).	1		
Make congruent shapes and designs.	1,4	1.G2. 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.	

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I. Numbers and Number Sense			
Write numbers to 1,000.	2	2.NBT 3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.	
Read and write words for numbers from one to one-hundred.	2	2.NBT 3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.	
Order and compare numbers to 1,000, using the signs <, >, and = .	2	2.NBT 4. Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.	
Count by twos, threes, fives, and tens by tens from any given number by hundreds to 1,000; by fifties to 1,000 forward and backward	2	2.NBT 2. Count within 1000; skip-count by 5s, 10s, and 100s.	
Use a number line.	2	2. MD 6. 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.	
Use tallies.	2		
Identify ordinal position, 1st to 20th, and write words for ordinal numbers, first to twentieth.	2		
Identify even and odd numbers.	2	2.OA 3. Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.	
Identify dozen; half-dozen; pair.	2		

Core Knowledge Sequence Grade 2	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Recognize place value: ones, tens, hundreds, thousands.	2	<p>2.NBT 1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:</p> <ul style="list-style-type: none"> a. 100 can be thought of as a bundle of ten tens – called a “hundred.” 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). 	
Write numbers up to hundreds in expanded form (for example $64 = 60 + 4$; $367 = 300 + 60 + 7$).	2	<p>2.NBT 1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:</p> <ul style="list-style-type: none"> a. 100 can be thought of as a bundle of ten tens – called a “hundred.” 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). <p>2.NBT 3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.</p>	
Given a number, identify one more and one less; ten more and ten less.	8	<p>2.NBT 8. Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.</p>	
Round to the nearest ten.	4		<p>3.NBT 1. Use place value understanding to round whole numbers to the nearest 10 or 100.</p>
Create and interpret simple bar graphs.	4	<p>2.MD 10. 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 problems using information presented in a bar graph.</p>	<p>3.MD 3. 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. <i>For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</i></p>

Core Knowledge Sequence Grade 2	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Identify and extend numerical and symbolic patterns.	7		<p>3.OA 9. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. <i>For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.</i></p> <p>4.OA 5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. <i>For example, 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 informally why the numbers will continue to alternate in this way.</i></p>
Record numeric data systematically and find the lowest and highest values in a data set.	6, 7		1. MD 4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
II. Fractions			
Recognize these fractions as part of a whole set or region and write the corresponding numerical symbols: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{10}$.	2	2.G 3. Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.	
Recognize fractions that are equal to 1.	7		<p>3.NF 3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.</p> <p>c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Examples: Express 3 in the form $3 = \frac{3}{1}$; recognize that $\frac{6}{1} = 6$; locate $\frac{4}{4}$ and 1 at the same point of a number line diagram.</p>
III. Money			
Recognize relative values of a penny, nickel, dime, quarter, and dollar.	2		
Write amounts of money using \$ and ¢ signs, and the decimal point.	2		
Show how different combinations of coins equal the same amounts of money.	2		

Core Knowledge Sequence Grade 2	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Add and subtract amounts of money.	2, 6	2.MD 8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using \$ and ¢ symbols appropriately. Example: If you have 2 dimes and 3 pennies, how many cents do you have?	
IV. Computation			
A. Addition			
Achieve timed mastery of addition facts (2 seconds).	8	2.OA 2. Fluently add and subtract within 20 using mental strategies. ² By end of Grade 2, know from memory all sums of two one-digit numbers.	
Recognize what an addend is.	2		1.OA 4. Understand subtraction as an unknown-addend problem. For example, subtract $10 - 8$ by finding the number that makes 10 when added to 8.
Know how to write addition problems horizontally and vertically.	2		
Know how to add in any order and check a sum by changing the order of the addends.	1		1.OA 6. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. 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 $12 - 8 = 4$); and creating equivalent but easier or known sums (e.g., adding $6 + 7$ by creating the known equivalent $6 + 6 + 1 = 12 + 1 = 13$).
Estimate the sum.	4		
Solve two-digit and three-digit addition problems with and without regrouping.	4, 6	2.NBT 7. Add and subtract within 1000, 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. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.	
Find the sum (up to 999) of any two whole numbers.	4, 6	2.NBT 5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.	

Core Knowledge Sequence Grade 2	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Add three two-digit numbers.	4, 6	2.NBT 6. Add up to four two-digit numbers using strategies based on place value and properties of operations.	
Practice doubling (adding a number to itself).	4, 6	2.NBT 5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.	3.NBT 2. 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.
B. Subtraction			
Understand the inverse relation between addition and subtraction; use addition to check subtraction.	1	2.NBT 5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.	
Know addition and subtraction “fact families.”	7	2.NBT 5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.	3.NBT 2. 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.
Achieve mastery of subtraction facts.	8	2.OA 2. Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.	
Estimate the difference.	4		
Know how to write subtraction problems horizontally and vertically.	2		
Solve two-digit and three-digit subtraction problems with and without regrouping.	4	2.NBT 7. Add and subtract within 1000, 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. Understand that in adding or subtracting three- digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.	
Given two whole numbers of 999 or less, find the difference.	4	2.NBT 5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.	
C. Introduction to Multiplication			
Recognize the “times” sign (x).	2		

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Know what “factor” and “product” mean.	2		3.OA 1. Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each. <i>For example, describe a context in which a total number of objects can be expressed as 5×7.</i>
Understand that you can multiply numbers in any order.	7		3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
Multiplication facts: know the product of any single-digit number \times 1, 2, 3, 4, 5.	7	2.OA 4. 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.	3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
Know what happens when you multiply by 1, by 0, and by 10.	7		3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
Practice simple word problems involving multiplication.	4, 6		3.OA 3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. ¹
D. Solving Problems and Equations			
Solve basic word problems.	2, 4, 6	2.OA 1. Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. ¹ 2.MD 5. 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.	

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Write and solve simple equations in the form of $___ - 9 = 7$; $7 + ___ = 16$; $4 \times ___ = 8$.	4, 6		1.OA 8. Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 + ? = 11$, $5 = ? - 3$, $6 + 6 = ?$.
V. Measurement			
A. Linear Measure			
Make linear measurements in feet and inches, and in centimeters.	2, 4, 5	2.MD 1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. 2.MD 4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.	
Know that one foot = 12 inches.	7		4.MD 1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table. <i>For example, 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), ...</i>
Know abbreviations: ft., in.	2		
Measure and draw line segments in inches to 1/2 inch, and in centimeters.	5	2.MD 6. 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 9. 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.	

Core Knowledge Sequence Grade 2	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Estimate linear measurements, then measure to check estimates.	1, 4	2.MD 3. Estimate lengths using units of inches, feet, centimeters, and meters.	
B. Weight			
Compare weights of objects using a balance scale.	5		
Estimate and measure weight in pounds, and know abbreviation: lb.	4		
C. Capacity (volume)			
Estimate and measure capacity in cups.	4		3.MD 2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).6 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.
Measure liquid volumes: cups, pints, quarts, gallons.	5		3.MD 2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).6 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.7
Compare U.S. and metric liquid volumes: quart and liter (one liter is a little more than one quart).	5		
D. Temperature			
Measure and record temperature in degrees Fahrenheit to the nearest 2 degrees.	5		
Know the degree sign: °	2		
E. Time			
Read a clock face and tell time to five-minute intervals.	2, 5	2.MD 7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.	
Know how to distinguish time as a.m. or p.m.	2	2.MD 7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.	
Understand noon and midnight.	2		

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Solve problems on elapsed time (how much time has passed?).	2, 4		3.MD 1. 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, e.g., by representing the problem on a number line diagram.
Using a calendar, identify the date, day of the week, month, and year.	5		
Write the date using words and numbers.	5		
VI. Geometry			
Identify and draw basic plane figures: square, rectangle, triangle, circle.	2, 7	2.G 1. 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.	
Describe square, rectangle, triangle according to number of sides; distinguish between square and rectangle as regards length of sides (a square has sides of equal length).	7	2.G 1. 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.	5.G 3. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.
Measure perimeter in inches of squares and rectangles.	5	2.G 2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.	3.MD 8. 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.
Identify solid figures—sphere, cube, pyramid, cone, cylinder—and associate solid figures with planar shapes: sphere (circle), cube (square), pyramid (triangle).	7	2.G 1. 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.	K.G 3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three dimensional (“solid”).
Make congruent shapes and designs.	7		1.G 2. 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.

Core Knowledge Sequence Grade 2	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Identify lines as horizontal; vertical; perpendicular; parallel.	7		<p>4.G 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.</p> <p>4.G 2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.</p>
Name lines and line segments (for example, line AB; segment CD).	7		<p>4.G 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.</p>
Identify a line of symmetry, and create simple symmetric figures.	7		<p>4.G 3. 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.</p>

Core Knowledge Sequence Grade 3	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
I. Numbers and Number Sense			
Read and write numbers (in digits and words) up to six digits.	2		2.NBT 3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.
Recognize place value up to hundred thousands.	6		2.NBT 1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases: <ul style="list-style-type: none"> a. 100 can be thought of as a bundle of ten tens — called a “hundred.” 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 3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.
Order and compare numbers to 999,999, using the signs $<$, $>$, and $=$.	1		2.NBT 4. Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using $>$, $=$, and $<$ symbols to record the results of comparisons.
Count by twos, threes, fives, and tens; count by tens from any given number.	2		2.NBT 2. Count within 1000; skip-count by 5s, 10s, and 100s.
Write numbers in expanded form.	2		2.NBT 3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.
Use a number line.	5		2. MD 6. 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.
Identify ordinal position, 1st to 100th.	2		
Review: even and odd numbers; dozen; half-dozen; pair.	2		2.OA 3. Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.
Round to the nearest ten; to the nearest hundred.	6	3.NBT 1. Use place value understanding to round whole numbers to the nearest 10 or 100.	

Core Knowledge Sequence Grade 3	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Identify perfect squares (and square roots) to 100, and recognize the square root sign: $\sqrt{\quad}$	2		8.EE 2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.
Identify Roman numerals from 1 to 20 (I - XX).	2		
Understand what negative numbers are in relation to familiar uses (such as temperatures below zero).	7		6.NS 5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
Locate positive and negative whole numbers on a number line.	5, 7		6.NS 5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
Create and interpret bar graphs and line graphs.	4	3.MD 3. 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. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.	2.MD 10. 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 problems using information presented in a bar graph.
Record outcomes for a simple event (for example, tossing a die) and display the results graphically.	4, 6	3.MD 3. 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. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.	
II. Fractions and Decimals			
Recognize fractions to $\frac{1}{10}$ and fractions whose denominator is 100.	2, 7	3.NF 1. Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$.	

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Identify numerator and denominator.	2	3.NF 1. 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 $1/b$.	
Write mixed numbers.	2		4.NF 3 Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. 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.
Recognize equivalent fractions (for example, $1/2 = 3/6$).	1, 8	3.NF 3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. b. Recognize and generate simple equivalent fractions, e.g., $1/2 = 2/4$, $4/6 = 2/3$. Explain why the fractions are equivalent, e.g., by using a visual fraction model.	
Compare fractions with like denominators, using the signs $<$, $>$, and $=$.	8	3.NF 3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. d. 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.	
Know and write decimal equivalents to $1/4$, $1/2$, $3/4$.	8		
Read and write decimals to the hundredths.	6, 8		5.NBT 3. Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.
III. Money			

Core Knowledge Sequence Grade 3	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Write amounts of money using \$ and ¢ signs, and the decimal point.	2		
Make change, using as few coins as possible.	2		
Add and subtract amounts of money.	2		2.MD 8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using \$ and ¢ symbols appropriately. Example: If you have 2 dimes and 3 pennies, how many cents do you have?
Multiply and divide amounts of money by small whole numbers.	2		2.MD 8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using \$ and ¢ symbols appropriately. Example: If you have 2 dimes and 3 pennies, how many cents do you have?
IV. Computation			
A. Addition			
Mentally estimate a sum.	4, 8		
Use mental computation strategies.	8	3.NBT 2. 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.	
Addition with and without regrouping: find the sum (up to 10,000) of any two whole numbers.	4, 6	3.NBT 2. 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.	4.NBT 4. Fluently add and subtract multi-digit whole numbers using the standard algorithm.
B. Subtraction			
Understand addition and subtraction as inverse operations; use addition to check subtraction.	1	3.NBT 2. 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.	
Review and practice basic subtraction facts.	1, 4	3.NBT 2. 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.	
Mentally estimate the difference.	4		
Use mental computation strategies.	8	3.NBT 2. 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.	

Core Knowledge Sequence Grade 3	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Subtraction with and without regrouping: given two whole numbers of 10,000 or less, find the difference.	1, 4	3.NBT 2. 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.	
C. Multiplication			
Master basic multiplication facts to 10×10 .	1, 4	3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.	
Mentally multiply, by 10, 100, and 1,000.	8	3.NBT 3. Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80 , 5×60) using strategies based on place value and properties of operations.	
Multiply two whole numbers, with and without regrouping, in which one factor is 9 or less and the other is a multi-digit number up to three digits.	6, 7, 8	3.OA 5. Apply properties of operations as strategies to multiply and divide.2 Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)	4.NBT 5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
Write numbers in expanded form using multiplication, for example: $9,278 = (9 \times 1,000) + (2 \times 100) + (7 \times 10) + 8$.	8		4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.
Estimate a product.	4		
Solve word problems involving multiplication.	2, 4	3.OA 3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.	
D. Division			

Core Knowledge Sequence Grade 3	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Understand multiplication and division as inverse operations.	1, 8	<p>3.OA 6. Understand division as an unknown-factor problem. For example, find $32 \div 8$ by finding the number that makes 32 when multiplied by 8.</p> <p>3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.</p>	
Know the meaning of dividend, divisor, and quotient.	2		<p>6.EE 2. Write, read, and evaluate expressions in which letters stand for numbers.</p> <p>b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. For example, describe the expression $2(8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms.</p>
Know basic division facts to $100 \div 10$.	1	<p>3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.</p>	
Know that you cannot divide by 0.	7		
Know that any number divided by 1 = that number.	7		
Divide two- and three-digit dividends by one-digit divisors.	1, 4		<p>4.NBT 6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.</p>
Solve division problems with remainders.	1, 4	<p>3.OA 3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.</p>	<p>4.NBT 6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.</p>

Core Knowledge Sequence Grade 3	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Check division by multiplying (and adding remainder).	1		
E. Solving Problems and Equations			
Solve two-step word problems.	2	3.OA 8. 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.	
Solve equations in the form of $___ \times 9 = 63$; $81 \div ___ = 9$.	4	3.OA 4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 \times ? = 48$, $5 = \div 3$, $6 \times 6 = ?$. 3.OA 6. Understand division as an unknown-factor problem. For example, find $32 \div 8$ by finding the number that makes 32 when multiplied by 8.	
Solve problems with more than one operation, as in $(43 - 32) \times (5 + 3) = ___$.	4	3.OA 8. 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.	
Read and write expressions that use parentheses to indicate order of multiple operations.	6, 7, 8	3.OA 5. Apply properties of operations as strategies to multiply and divide. ² Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)	

Core Knowledge Sequence Grade 3	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
V. Measurement			
A. Linear Measure			
Make linear measurements in yards, feet, and inches; and, in centimeters and meters.	5		2.MD 1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. 2.MD 4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.
Know that one foot = 12 inches; one yard = 36 inches; 3 feet = 1 yard; 1 meter = 100 centimeters; 1 meter is a little more than one yard.	5, 7		4.MD 1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. <i>For example, 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), ...</i>
Measure and draw line segments in inches (to 1/4 inch), and in centimeters.	5	3.MD 4. 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.	
Estimate linear measurements, then measure to check estimates.	1, 4		2.MD 3. Estimate lengths using units of inches, feet, centimeters, and meters.
B. Weight			
Compare weights of objects using a balance scale.	5		
Estimate and measure weight in pounds and ounces; grams and kilograms.	4		
Know abbreviations: lb., oz., g, kg	2		
C. Capacity (volume)			

Core Knowledge Sequence Grade 3	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Estimate and measure liquid capacity in cups, pints, quarts, gallons, and liters.	4	3.MD 2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).6 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.	
Know that 1 quart = 2 pints; 1 gallon = 4 quarts.	7		4.MD 1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table. <i>For example, 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), ...</i>
Compare U.S. and metric liquid volumes: quart and liter (one liter is a little more than one quart).	7		4.MD 1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table. <i>For example, 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), ...</i>
D. Temperature			
Measure and record temperature in degrees Fahrenheit and Celsius.	2, 5		
Know the degree sign: °	2		
Identify freezing point of water as 32° F = 0° C.	7		
E. Time			
Read a clock face and tell time to the minute as either a.m. or p.m.; tell time in terms of both “minutes before” and “minutes after” the hour.	2, 5	3.MD 1. 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, e.g., by representing the problem on a number line diagram.	

Core Knowledge Sequence Grade 3	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Solve problems on elapsed time (how much time has passed?).	2, 4	3.MD 1. 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, e.g., by representing the problem on a number line diagram.	
Using a calendar, identify the date, day of the week, month, and year.	2, 5		
Write the date using words (for name of month) and numbers, and only numbers.	2		
VI. Geometry			
Identify lines as horizontal, vertical, perpendicular, or parallel.	7		4.G 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. 4.G 2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.
Name lines and line segments (for example, line AB; segment CD).	7		4.G 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
Polygons: recognize vertex (plural: vertices); identify sides as line segments (for example, side CD); identify pentagon, hexagon, and octagon (regular).	7		4.G 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
Identify angles by letter names (for example, \angle ABC); identify a right angle; know that there are four right angles in a square or rectangle.	7		4.MD 5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:

Core Knowledge Sequence Grade 3	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Compute area in square inches (in ²) and square centimeters (cm ²).	6, 7, 8	<p>3.MD 5. Recognize area as an attribute of plane figures and understand concepts of area measurement.</p> <ul style="list-style-type: none"> a. 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. b. 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. <p>3.MD 6. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).</p> <p>3.MD 7. Relate area to the operations of multiplication and addition.</p> <ul style="list-style-type: none"> a. 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. b. 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. c. 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. d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems. 	
Recognize and draw congruent figures; identify a line of symmetry, and create symmetric figures.	7		4.G 3. 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.
Identify solid figures: sphere, cube, rectangular solid, pyramid, cone, cylinder.	7		K.G 3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three dimensional (“solid”).

(DRAFT)

Core Knowledge Sequence Grade 4	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
I. Numbers and Number Sense			
Read and write numbers (in digits and words) up to nine digits.	2	4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.	
Recognize place value up to hundred millions.	6	4. NBT. 1. 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. For example, recognize that $700 \div 70 = 10$ by applying concepts of place value and division.	
Order and compare numbers to 999,999,999 using the signs $<$, $>$, and $=$.	8	4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.	6.EE 8. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
Write numbers in expanded form.	8	4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.	
Use a number line; locate positive and negative whole numbers on a number line.	5		2. MD 6. 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.
Round to the nearest ten; to the nearest hundred; to the nearest thousand.	6	4.NBT 3. Use place value understanding to round multi-digit whole numbers to any place.	

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Identify perfect squares (and square roots) to 144; recognize the square root sign: $\sqrt{\quad}$	2		
Identify Roman numerals from 1 to 1,000 (I - M), and identify years as written in Roman numerals.	2		
Create and interpret bar graphs and line graphs.	2, 4		3.MD 3. 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. <i>For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</i>
Plot points on a coordinate plane (grid), using ordered pairs of positive whole numbers.	2, 4		<p>5.OA 3. Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. <i>For example, 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, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.</i></p> <p>6.NS 6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.</p> <ul style="list-style-type: none"> a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

Core Knowledge Sequence Grade 4	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Know the meanings of multiple, factor, prime number, and composite number.	2	4.OA 4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.	
II. Fractions and Decimals			
A. Fractions			
Recognize fractions to one-twelfth.	2		3.NF 1. 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 $1/b$.
Identify numerator and denominator.	2		3.NF 1. 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 $1/b$.
Write mixed numbers; change improper fractions to mixed numbers and vice versa.	8	4.NF 3. Use place value understanding to round multi-digit whole numbers to any place. 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. Examples: $3/8 = 1/8 + 1/8 + 1/8$; $3/8 = 1/8 + 2/8$; $2\ 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8$.	
Recognize equivalent fractions (for example, $1/2 = 3/6$).	8	4.NF 1. Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.	
Put fractions in lowest terms.	8		3.NF 3 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. b. Recognize and generate simple equivalent fractions, e.g., $1/2 = 2/4$, $4/6 = 2/3$. Explain why the fractions are equivalent, e.g., by using a visual fraction model.

Core Knowledge Sequence Grade 4	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Rename fractions with unlike denominators to fractions with common denominators.	8	4.NF 2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$. 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, e.g., by using a visual fraction model.	
Compare fractions with like and unlike denominators, using the signs $<$, $>$, and $=$.	8	4.NF 2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$. 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, e.g., by using a visual fraction model. 4.NF 5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.4 For example, express $\frac{3}{10}$ as $\frac{30}{100}$, and add $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$.	
Solve problems in the form of $\frac{2}{3} = \frac{8}{12}$	4	4.NF 2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$. 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, e.g., by using a visual fraction model.	

Core Knowledge Sequence Grade 4	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Add and subtract fractions with like denominators.	1, 4	<p>4.NF 3. Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$.</p> <ul style="list-style-type: none"> a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. 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. 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. 	
Express simple outcomes as fractions (for example, 3 out of 4 as $3/4$).	8		
B. Decimals			
Read and write decimals to the nearest thousandth.	6		<p>5.NBT 3. Read, write, and compare decimals to thousandths.</p> <ul style="list-style-type: none"> a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.
Read and write decimals as fractions (for example, $0.39 = 39/100$).	8	<p>4.NF 6. Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as $62/100$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.</p>	
Write decimal equivalents for halves, quarters, eighths, and tenths.	8	<p>4.NF 6. Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as $62/100$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.</p>	
Compare fractions to decimals using the signs $<$, $>$, and $=$.	8	<p>4.NF 7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual model.</p>	

Core Knowledge Sequence Grade 4	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Write decimals in expanded form.	8		5.NBT 3. Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.
Round decimals to the nearest tenth; to the nearest hundredth.	6		5.NBT 4. Use place value understanding to round decimals to any place.
Compare decimals, using the signs $<$, $>$, and $=$.	6	4.NF 7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual model.	
Read and write decimals on a number line.	6	4.NF 6. Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as $62/100$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.	3.NF 2. Understand a fraction as a number on the number line; represent fractions on a number line diagram. a. 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. b. 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.
Add and subtract with decimal numbers to two places.	1, 4		5.NBT 7. Add, subtract, multiply, and divide decimals to hundredths, 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.
III. Money			
Solve problems involving making change in amounts up to \$100.00.	1, 4		2.MD 8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using \$ and ¢ symbols appropriately. <i>Example: If you have 2 dimes and 3 pennies, how many cents do you have?</i>

Core Knowledge Sequence Grade 4	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Solve multiplication and division problems with money.	1, 4	4.MD 2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.	
IV. Computation			
A. Multiplication			
Review and reinforce basic multiplication facts to 10 x 10.	1, 4		3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
Mentally multiply by 10, 100, and 1,000.	1, 4	4.NBT 5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	3.NBT 3. Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80 , 5×60) using strategies based on place value and properties of operations. 5.NBT 2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.
Identify multiples of a given number; common multiples of two given numbers.	1, 4		
Multiply by two-digit and three-digit numbers.	1, 4	4.NBT 5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	
Write numbers in expanded form using multiplication.	8	4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.	
Estimate a product.	4		

Core Knowledge Sequence Grade 4	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Use mental computation strategies for multiplication, such as breaking a problem into partial products, for example: $3 \times 27 = (3 \times 20) + (3 \times 7) = 60 + 21 = 81$.	8	4.NBT 5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	
Check multiplication by changing the order of the factors.	1	4.OA 1. Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.	
Multiply three factors in any given order.	1, 7		
Solve word problems involving multiplication.	2	4.OA 2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. 4.OA 3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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.	
B. Division			

Core Knowledge Sequence Grade 4	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Understand multiplication and division as inverse operations.	6, 7, 8		<p>3.OA 2. 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. For example, describe a context in which a number of shares or a number of groups can be expressed as $56 \div 8$</p> <p>3.OA 4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 \times ? = 48$, $5 = \square \div 3$, $6 \times 6 = ?$.</p> <p>3.OA 5. Apply properties of operations as strategies to multiply and divide.2 Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)</p> <p>3.OA 6. Understand division as an unknown-factor problem. For example, find $32 \div 8$ by finding the number that makes 32 when multiplied by 8.</p> <p>3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.</p>
Review the meaning of dividend, divisor, and quotient.	1, 2, 4		<p>6.EE 2. Write, read, and evaluate expressions in which letters stand for numbers.</p> <p>b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. For example, describe the expression $2(8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms.</p>
Review and reinforce basic division facts to $100 \div 10$.	1, 4		<p>3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.</p>

Core Knowledge Sequence Grade 4	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Identify different ways of writing division problems: $28 \div 7 = 4$ $28/7$	8		
Identify factors of a given number; common factors of two given numbers.	8	4.OA.4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.	
Review: you cannot divide by 0; any number divided by 1 = that number.	7		
Estimate the quotient.	4		
Divide dividends up to four-digits by one-digit and two-digit divisors.	1, 4	4.NBT.6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	
Solve division problems with remainders.	1, 4	4.OA.3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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.	
Check division by multiplying (and adding remainder).	1		
C. Solving Problems and Equations			

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Solve two-step word problems.	1, 4	4.OA 3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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.	
Solve equations in the form of $___ \times 9 = 63$; $81 \div ___ = 9$.	6, 7, 8		<p>3.OA 4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 \times ? = 48$, $5 = \div 3$, $6 \times 6 = ?$.</p> <p>3.OA 5. Apply properties of operations as strategies to multiply and divide.² Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)</p> <p>3.OA 6. Understand division as an unknown-factor problem. For example, find $32 \div 8$ by finding the number that makes 32 when multiplied by 8.</p>
Solve problems with more than one operation, as in $(72 \div 9) \times (36 \div 4) = ___$	1, 4	4.OA 3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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.	
Equality properties Know that equals added to equals are equal. Know that equals multiplied by equals are equal.	7		

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Use letters to stand for any number, as in working with a formula (for example, area of rectangle: $A = L \times W$).	2		<p>6. EE 2. Write, read, and evaluate expressions in which letters stand for numbers.</p> <ul style="list-style-type: none"> a. Write expressions that record operations with numbers and with letters standing for numbers. <i>For example, express the calculation “Subtract y from 5” as $5 - y$.</i> c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). <i>For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = \frac{1}{2}$.</i>
V. Measurement			
Linear measure: estimate and make linear measurements in yards, feet, and inches (to $\frac{1}{8}$ in.); and in meters, centimeters, and millimeters.	4	4.MD 1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two- column table. For example, 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), ...	
Weight: estimate and measure weight in pounds and ounces; grams and kilograms.	4	4.MD 1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two- column table. For example, 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), ...	

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Capacity (volume): estimate and measure liquid capacity in teaspoons, tablespoons, cups, pints, quarts, gallons; and in milliliters and liters.	4	4.MD 1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two- column table. For example, 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), ...	
<p>Know the following equivalences among U. S. customary units of measurement, and solve problems involving changing units of measurement:</p> <p>Linear measure</p> <p>1 ft. = 12 in.</p> <p>1 yd. = 3 ft. = 36 in.</p> <p>1 mi. = 5,280 ft.</p> <p>1 mi. = 1,760 yd.</p> <p>Weight</p> <p>1 lb. = 16 oz.</p> <p>1 ton = 2,000 lb.</p> <p>Capacity (volume)</p> <p>1 cup = 8 fl. oz. (fluid ounces)</p> <p>1 pt. = 2 c.</p> <p>1 qt. = 2 pt.</p> <p>1 gal. = 4 qt.</p>	2	4.MD 2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.	

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<p>Know the following equivalences among metric units of measurement, and solve problems involving changing units of measurement:</p> <p>Linear measure</p> <p>1 cm = 10 mm (millimeters)</p> <p>1 m = 1,000 mm</p> <p>1 m = 100 cm</p> <p>1 km = 1,000 m</p> <p>Mass</p> <p>1 cg (centigram) = 10 mg (milligrams)</p> <p>1 g = 1,000 mg</p> <p>1 g = 100 cg</p> <p>1 kg = 1,000 g</p> <p>Capacity (volume)</p> <p>1 cl (centiliter) = 10 ml (milliliters)</p> <p>1 liter = 1,000 ml</p> <p>1 liter = 100 cl</p>	2	<p>4.MD 2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.</p>	
Time: solve problems on elapsed time.	2	<p>4.MD 2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.</p>	
VI. Geometry			
Identify and draw points, segments, rays, lines.	5	<p>4.G 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.</p>	
Identify and draw lines: horizontal; vertical; perpendicular; parallel; intersecting.	7	<p>4.G 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.</p>	

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Identify angles; identify angles as right, acute, or obtuse.	7	<p>4.G 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.</p> <p>4.G 2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.</p> <p>4.MD 5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:</p> <ul style="list-style-type: none"> a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $1/360$ of a circle is called a “one-degree angle,” and can be used to measure angles. b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees. 	
Identify polygons: Triangle, quadrilateral, pentagon, hexagon, and octagon (regular) Parallelogram, trapezoid, rectangle, square	7		
Identify and draw diagonals of quadrilaterals.	7		<p>3.G 1. 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.</p>
Circles: Identify radius (plural: radii) and diameter; radius = $1/2$ diameter	7		

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Recognize similar and congruent figures.	7		8.G 2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
Know the formula for the area of a rectangle (Area = length x width) and solve problems involving finding area in a variety of square units (such as mi ² ; yd ² ; ft ² ; in ² ; km ² ; m ² ; cm ² ; mm ²)	7	4.MD 3. Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, 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.	
Compute volume of rectangular prisms in cubic units (cm ³ , in ³).	7		5.MD 3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement. 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. 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.

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I. Numbers and Number Sense			
Read and write numbers (in digits and words) up to the billions.	1, 2		4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.
Recognize place value up to billions.	6	5.NBT 1. 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.	
Order and compare numbers to 999,999,999 using the signs $<$, $>$, and $=$.	8		4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.
Write numbers in expanded form.	8		4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.

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<p>Integers</p> <p>Locate positive and negative integers on a number line.</p> <p>Compare integers using the symbols $<$, $>$, $=$.</p> <p>Know that the sum of an integer and its opposite is 0.</p> <p>Add and subtract positive and negative integers.</p>	7		<p>6.NS 5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.</p> <p>6.NS 6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.</p> <ul style="list-style-type: none"> a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
<p>Using a number line, locate positive and negative whole numbers.</p>	5		<p>6.NS 6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.</p> <ul style="list-style-type: none"> a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

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Round to the nearest ten; to the nearest hundred; to the nearest thousand; to the nearest hundred thousand.	6		3.NBT 1 Use place value understanding to round whole numbers to the nearest 10 or 100. 4.NBT 3 Use place value understanding to round multi-digit whole numbers to any place.
Exponents Review perfect squares and square roots to 144; recognize the square root sign, $\sqrt{\quad}$. Using the terms squared and cubed and to the nth power, read and evaluate numerical expressions with exponents. Identify the powers of ten up to 10^6 .	7	5.NBT 2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.	6.EE 1. Write and evaluate numerical expressions involving whole-number exponents. 8.EE 3. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9 , and determine that the world population is more than 20 times larger.
Identify a set and the members of a set, as indicated by $\{ \}$.	2	5.OA 1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.	
Identify numbers under 100 as prime or composite.	7		4.OA 4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.
Identify prime factors of numbers to 100 and write using exponential notation for multiple primes.	7		4.OA 4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.
Determine the greatest common factor (GCF) of given numbers.	6, 7, 8		6.NS 4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. <i>For example, express $36 + 8$ as $4(9 + 2)$.</i>

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Determine the least common multiple (LCM) of given numbers.	6, 7, 8		6.NS 4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. <i>For example, express $36 + 8$ as $4(9 + 2)$.</i>
II. Ratio and Percent			
A. Ratio			
Determine and express simple ratios.	8		6.RP 1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, “The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak.” “For every vote candidate A received, candidate C received nearly three votes.” 6.RP 2. Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. For example, “This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $3/4$ cup of flour for each cup of sugar.” “We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger.”
Use ratio to create a simple scale drawing.	8		6.RP 3. a. Make tables of equivalent ratios relating quantities with whole- number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
Ratio and rate: solve problems on speed as a ratio, using the formula $S = d/t$ (or $D = r \times t$).	1, 4		6.RP 3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. b. Solve unit rate problems including those involving unit pricing and constant speed. <i>For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?</i>
B. Percent			

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Recognize the percent sign (%) and understand percent as “per hundred.”	2		<p>6.RP 3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.</p> <p>c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.</p>
Express equivalences between fractions, decimals, and percents, and know common equivalences: $1/10 = 10\%$ $1/4 = 25\%$ $1/2 = 50\%$ $3/4 = 75\%$	8		<p>3.NF 3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.</p> <p>a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.</p> <p>b. Recognize and generate simple equivalent fractions, e.g., $1/2 = 2/4$, $4/6 = 2/3$. Explain why the fractions are equivalent, e.g., by using a visual fraction model.</p> <p>4.NF 5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.4 <i>For example, express $3/10$ as $30/100$, and add $3/10 + 4/100 = 34/100$.</i></p> <p>6.RP3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.</p>
Find the given percent of a number.	2, 4		
III. Fractions and Decimals			
A. Fractions			
Determine the least common denominator (LCD) of fractions with unlike denominators.	6, 7, 8		<p>6.NS 4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. <i>For example, express $36 + 8$ as $4(9 + 2)$.</i></p>

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Recognize equivalent fractions (for example, $\frac{1}{2} = \frac{3}{6}$).	8	5.NF 1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, $\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}$. (In general, $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$.)	
Put fractions in lowest terms.	6, 7, 8		6.NS 4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. <i>For example, express $36 + 8$ as $4(9 + 2)$.</i>
Compare fractions with like and unlike denominators, using the signs $<$, $>$, and $=$.	8	5.NF 5. 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.	
Identify the reciprocal of a given fraction; know that the product of a given number and its reciprocal = 1.	7		
Add and subtract mixed numbers and fractions with like and unlike denominators.	1, 4	5.NF 1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, $\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}$. (In general, $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$.)	
Multiply and divide fractions.	1, 4	5.NF 4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product $(\frac{a}{b}) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \times \frac{1}{b}$. For example, use a visual fraction model to show $(\frac{2}{3}) \times 4 = \frac{8}{3}$, and create a story context for this equation. Do the same with $(\frac{2}{3}) \times (\frac{4}{5}) = \frac{8}{15}$. (In general, $(\frac{a}{b}) \times (\frac{c}{d}) = \frac{ac}{bd}$.) b. Find the area of a rectangle with fractional	4.NF 4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. a. Understand a fraction $\frac{a}{b}$ as a multiple of $\frac{1}{b}$. For example, use a visual fraction model to represent $\frac{5}{4}$ as the product $5 \times (\frac{1}{4})$, recording the conclusion by the equation $\frac{5}{4} = 5 \times (\frac{1}{4})$. b. Understand a multiple of $\frac{a}{b}$ as a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number. For example, use a visual fraction model to express $3 \times (\frac{2}{5})$ as $6 \times (\frac{1}{5})$, recognizing this product as $\frac{6}{5}$. (In general, $n \times (\frac{a}{b}) = (\frac{n \times a}{b})$)

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		<p>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.</p> <p>5.NF 5. Interpret multiplication as scaling (resizing), by:</p> <ul style="list-style-type: none"> b. Explaining 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); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1. <p>5.NF 7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.</p> <ul style="list-style-type: none"> a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for $(1/3) \div 4$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $(1/3) \div 4 = 1/12$ because $(1/12) \times 4 = 1/3$. b. Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for $4 \div (1/5)$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $4 \div (1/5) = 20$ because $20 \times (1/5) = 4$. c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, 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? 	<p>a)/b.)</p> <ul style="list-style-type: none"> c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. For example, 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?

Core Knowledge Sequence Grade 5	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Add and subtract fractions with like and unlike denominators.	1, 4	5.NF 1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, $2/3 + 5/4 = 8/12 + 15/12 = 23/12$. (In general, $a/b + c/d = (ad + bc)/bd$.)	
Add and subtract mixed numbers and fractions; multiply mixed numbers and fractions.	1, 4	<p>5.NF 1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, $2/3 + 5/4 = 8/12 + 15/12 = 23/12$. (In general, $a/b + c/d = (ad + bc)/bd$.)</p> <p>5.NF 2. 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. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result $2/5 + 1/2 = 3/7$, by observing that $3/7 < 1/2$.</p> <p>5.NF 3. Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). 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. 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 $3/4$. 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?</p> <p>5 NF 6. Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.</p>	
Round fractions to the nearest whole number.	6		

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Write fractions as decimals (e.g., $\frac{1}{4} = 0.25$; $\frac{17}{25} = 0.68$; $\square = 0.3333\ldots$ or 0.33 , rounded to the nearest hundredth).			4.NF 6. Use decimal notation for fractions with denominators 10 or 100. <i>For example, rewrite 0.62 as $\frac{62}{100}$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.</i>
B. Decimals			
Read, write, and order decimals to the nearest ten-thousandth.	6	5.NBT 3. Read, write, and compare decimals to thousandths.	
Write decimals in expanded form.	8	5.NBT 3. Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.	
Read and write decimals on a number line.	1		4.NF 6 Use decimal notation for fractions with denominators 10 or 100. <i>For example, rewrite 0.62 as $\frac{62}{100}$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.</i>
Round decimals (and decimal quotients) to the nearest tenth; to the nearest hundredth; to the nearest thousandth.	4	5.NBT 4. Use place value understanding to round decimals to any place.	
Estimate decimal sums, differences, and products by rounding.	4		
Add and subtract decimals through ten-thousandths.	1, 4	5.NBT 7. Add, subtract, multiply, and divide decimals to hundredths, 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.	
Multiply decimals: by 10, 100, and 1,000; by another decimal.	1, 4	5.NBT 7. Add, subtract, multiply, and divide decimals to hundredths, 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.	

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Divide decimals by whole numbers and decimals.	1, 4	5.NBT 7. Add, subtract, multiply, and divide decimals to hundredths, 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.	
IV. Computation			
A. Addition			
Commutative and associative properties: know the names and understand the properties.	6, 7, 8		1.OA 3. Apply properties of operations as strategies to add and subtract. ³ <i>Examples: If $8 + 3 = 11$ is known, then $3 + 8 = 11$ is also known. (Commutative property of addition.) To add $2 + 6 + 4$, the second two numbers can be added to make a ten, so $2 + 6 + 4 = 2 + 10 = 12$. (Associative property of addition.)</i>
B. Multiplication			
Commutative, associative, and distributive properties: know the names and understand the properties.	7		3.OA 5. Apply properties of operations as strategies to multiply and divide. ² <i>Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)</i>
Multiply two factors of up to four digits each.	1, 4	5.NBT 5. Fluently multiply multi-digit whole numbers using the standard algorithm.	
Write numbers in expanded form using multiplication.	8		4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.
Estimate a product.	4		
Use mental computation strategies for multiplication, such as breaking a problem into partial products, for example: $3 \times 27 = (3 \times 20) + (3 \times 7) = 60 + 21 = 81$.	2, 8		4.NBT 5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

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Solve word problems involving multiplication.	1, 2, 4	5.NF 6. Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.	
C. Division			
Understand multiplication and division as inverse operations.	6, 7, 8	5.NBT 6. 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. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	<p>3.OA 2. 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. For example, describe a context in which a number of shares or a number of groups can be expressed as $56 \div 8$</p> <p>3.OA 4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 \times ? = 48$, $5 = \square \div 3$, $6 \times 6 = ?$.</p> <p>3.OA 5. Apply properties of operations as strategies to multiply and divide.² Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)</p> <p>3.OA 6. Understand division as an unknown-factor problem. For example, find $32 \div 8$ by finding the number that makes 32 when multiplied by 8.</p> <p>3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.</p>
Know what it means for one number to be “divisible” by another number.	7		
Know that you cannot divide by 0; that any number divided by 1 = that number.	7		
Estimate the quotient.	4		

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Know how to move the decimal point when dividing by 10, 100, or 1,000.	7	5.NBT 7. Add, subtract, multiply, and divide decimals to hundredths, 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.	
Divide dividends up to four digits by one-digit, two-digit, and three-digit divisors.	1, 4	5.NBT 6. 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. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	
Solve division problems with remainders; round a repeating decimal quotient.	1, 4		4.OA 3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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.
Check division by multiplying (and adding remainder).	1		4.OA 3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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.
D. Solving Problems and Equations			
Solve word problems with multiple steps.	1, 2, 4		4.OA 3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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.

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Solve problems with more than one operation.	1, 4		4.OA 3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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.
V. Measurement			
Convert to common units in problems involving addition and subtraction of different units.	8	5.MD 1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.	
Time: Solve problems on elapsed time; regroup when multiplying and dividing amounts of time.	1, 2, 4		4.MD 2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
VI. Geometry			
Identify and draw points, segments, rays, lines.	7		4.G 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
Identify and draw lines: horizontal; vertical; perpendicular; parallel; intersecting.	7		4.G 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
Measure the degrees in angles, and know that right angle = 90° acute angle: less than 90° obtuse angle: greater than 90° straight angle = 180°	7		4.MD 6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
Identify and construct different kinds of triangles: equilateral, right, and isosceles.	7		7.G 2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

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Know what it means for triangles to be congruent.	7		8.G 2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
Identify polygons: triangle, quadrilateral, pentagon, hexagon, and octagon parallelogram, trapezoid, rhombus, rectangle, square	7	5. G 3. Understand that attributes belonging to a category of two-dimensional figures also belongs to all sub categories of that category. <i>For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.</i> 5.G 4. Classify two-dimensional figures in a hierarchy based on properties.	
Know that regular polygons have sides of equal length and angles of equal measure.	7	5. G 3. Understand that attributes belonging to a category of two-dimensional figures also belongs to all sub categories of that category. <i>For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.</i>	
Identify and draw diagonals of polygons.	7		
Circles Identify arc, chord, radius (plural: radii), and diameter (radius = 1/2 diameter). Using a compass, draw circles with a given diameter or radius. Find the circumference of a circle using the formulas $C = \pi d$, and $C = 2 \pi r$, using 3.14 as the value of pi.	5		7.G 4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

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<p>Area</p> <p>Review the formula for the area of a rectangle (Area = length x width) and solve problems involving finding area in a variety of square units (such as mi²; yd²; ft²; in²; km²; m²; cm²; mm²).</p> <p>Find the area of triangles, using the formula $A = \frac{1}{2}(b \times h)$.</p> <p>Find the area of a parallelogram using the formula $A = b \times h$.</p> <p>Find the area of an irregular figure (such as a trapezoid) by dividing into regular figures for which you know how to find the area.</p> <p>Compute volume of rectangular prisms in cubic units (cm³, in³), using the formula $V = l \times w \times h$.</p> <p>Find the surface area of a rectangular prism.</p>	<p>6, 7, 8</p>	<p>5.MD 3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement.</p> <ul style="list-style-type: none"> 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. 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. <p>5.MD 4. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.</p> <p>5.NF 4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.</p> <ul style="list-style-type: none"> 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. <p>5.MD 5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.</p> <ul style="list-style-type: none"> 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 the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. b. 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. c. 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. 	<p>7.G 6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.</p>

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VII. Probability and Statistics			
Understand probability as a measure of the likelihood that an event will happen; using simple models, express probability of a given event as a fraction, as a percent, and as a decimal between 0 and 1.	4		7.SP 5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
Collect and organize data in graphic form (bar, line, and circle graphs).	4		7.SP 6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.
Solve problems requiring interpretation and application of graphically displayed data.	1, 4	5.MD 2. 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. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.	4.MD 2. 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. <i>For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.</i>
Find the average (mean) of a given set of numbers.	4		
Plot points on a coordinate plane, using ordered pairs of positive and negative whole numbers.	1, 4	5.G 1. 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 and a given point in the plane located by using an ordered pair of numbers, called its coordinates. 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 2. 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.	

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Graph simple functions.	4		8.F 1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
VIII. Pre-Algebra			
Recognize variables and solve basic equations using variables.	1, 2		6.EE 6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
Write and solve equations for word problems.	1, 2	5.OA 2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation “add 8 and 7, then multiply by 2” as $2 \times (8 + 7)$. Recognize that $3 \times (18932 + 921)$ is three times as large as $18932 + 921$, without having to calculate the indicated sum or product.	6.EE 5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
Find the value of an expression given the replacement values for the variables.	8	5.OA 2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation “add 8 and 7, then multiply by 2” as $2 \times (8 + 7)$. Recognize that $3 \times (18932 + 921)$ is three times as large as $18932 + 921$, without having to calculate the indicated sum or product.	

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Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
I. Numbers and Number Sense			
Read and write numbers (in digits and words) up to the trillions.	2		4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.
Recognize place value up to hundred-billions.	6		4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.

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<p>Integers (review):</p> <p>Locate positive and negative integers on a number line.</p> <p>Compare integers using $<$, $>$, $=$.</p> <p>Know that the sum of an integer and its opposite is 0.</p> <p>Add and subtract positive and negative integers.</p>	<p>7</p>	<p>6.NS 7. Understand ordering and absolute value of rational numbers.</p> <ul style="list-style-type: none"> a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. For example, interpret $-3 > -7$ as a statement that -3 is located to the right of -7 on a number line oriented from left to right. b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write $-3\text{ }^{\circ}\text{C} > -7\text{ }^{\circ}\text{C}$ to express the fact that $-3\text{ }^{\circ}\text{C}$ is warmer than $-7\text{ }^{\circ}\text{C}$. c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of -30 dollars, write $-30 = 30$ to describe the size of the debt in dollars. d. Distinguish comparisons of absolute value from statements about order. For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars. <p>6.NS 6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.</p> <ul style="list-style-type: none"> a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite. b. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. 	<p>7.EE 3. Solve multi-step real-life and mathematical problems posed with positive and negative numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional $\frac{1}{10}$ of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar $9\frac{3}{4}$ inches long in the center of a door that is $27\frac{1}{2}$ inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.</p>

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<p><i>Continued:</i> Integers (review): Locate positive and negative integers on a number line. Compare integers using $<$, $>$, $=$. Know that the sum of an integer and its opposite is 0. Add and subtract positive and negative integers.</p>	7	<p>6.NS 6. Continued...</p> <p>c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a</p> <p>6.EE 8. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.</p>	
Determine whether a number is a prime number or composite number.	7		<p>4.OA 4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.</p>
Round to the nearest ten; to the nearest hundred; to the nearest thousand; to the nearest hundred thousand; to the nearest million	1, 4		<p>5.NBT 1. 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.</p>

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Compare and order whole numbers, mixed numbers, fractions, and decimals, using the symbols $<$, $>$, $=$.	8		<p>3.NF 3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.</p> <p>d. 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.</p> <p>4.NF 2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$. 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, e.g., by using a visual fraction model.</p> <p>4.NBT 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.</p> <p>5.NBT 3. Read, write, and compare decimals to thousandths.</p> <p>b. Compare two decimals to thousandths based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.</p>
Determine the greatest common factor (GCF) of given numbers.	6, 7, 8	6.NS 4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express $36 + 8$ as $4(9 + 2)$.	
Determine the least common multiple (LCM) of given numbers.	6, 7, 8	6.NS 4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express $36 + 8$ as $4(9 + 2)$.	

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<p>Exponents:</p> <p>Review squares and square roots.</p> <p>Using the terms squared and cubed and to the nth power, read and evaluate numerical expressions with exponents.</p> <p>Review powers of ten.</p> <p>Write numbers in expanded notation using exponents.</p>	7		8.EE 2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.
II. Ratio, Percent, and Proportion			
A. Ratio and Proportion			
Solve proportions, including word problems involving proportions with one unknown.	2	<p>6.RP 3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.</p> <p>b. Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?</p>	
Use ratios and proportions to interpret map scales and scale drawings.	2, 4		
Set up and solve proportions from similar triangles.	1, 4		8.EE 6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b .
Understand the justification for solving proportions by cross-multiplication.	7		
B. Percent			
Convert between fractions, decimals, and percents.	8		4.NF 6. Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as $\frac{62}{100}$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.

Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Find the given percent of a number, and find what percent a given number is of another number.	8	6.RP3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.	
Solve problems involving percent increase and decrease.	8		7.RP 3. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.
Find an unknown number when a percent of the number is known.	8	6.RP 3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.	
Use expressions with percents greater than 100% and less than 1%.	8		
III. Computation			
A. Addition			

Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
<p>Addition, commutative and associative properties: know the names and understand the properties.</p> <p>Understand addition and subtraction as inverse operations.</p> <p>Add and subtract with integers, fractions and decimals, both positive and negative.</p>	7		<p>7.NS 1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</p> <ul style="list-style-type: none"> a. Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged. b. Understand $p + q$ as the number located a distance q from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. d. Apply properties of operations as strategies to add and subtract rational numbers. <p>7.EE 4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.</p> <ul style="list-style-type: none"> a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width? b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.
B. Multiplication			

Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Commutative, associative, and distributive properties: know the names and understand the properties.	6, 7, 8		3.OA 5. Apply properties of operations as strategies to multiply and divide. ² <i>Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.)</i> Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)
Multiply multi-digit factors, with and without a calculator.	1, 4		5.NBT 5. Fluently multiply multi-digit whole numbers using the standard algorithm.
Estimate a product.	4		
Multiply with integers, fractions, and decimals, both positive and negative.	6, 7, 8	6.NS 3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	7.NS 2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. c. Apply properties of operations as strategies to multiply and divide rational numbers
Distributive property for multiplication over addition or subtraction, that is, $A \times (B+C)$ or $A \times (B-C)$: understand its use in procedures such as multi-digit multiplication.	6, 7, 8		
C. Division			

Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Understand multiplication and division as inverse operations.	6, 7, 8		<p>3.OA 2. 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. For example, describe a context in which a number of shares or a number of groups can be expressed as $56 \div 8$</p> <p>3.OA 4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 \times ? = 48$, $5 = \square \div 3$, $6 \times 6 = ?$.</p> <p>3.OA 5. Apply properties of operations as strategies to multiply and divide.² Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)</p> <p>3.OA 6. Understand division as an unknown-factor problem. For example, find $32 \div 8$ by finding the number that makes 32 when multiplied by 8.</p> <p>3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.</p> <p>5.NBT 6. 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. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.</p>
Estimate the quotient.	4		
Divide multi-digit dividends by up to three-digit divisors, with and without a calculator.	1, 4	6.NS 2. Fluently divide multi-digit numbers using the standard algorithm.	

Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Divide with integers, fractions, or decimals, both positive and negative.	1, 4	6NS 1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for $(\frac{2}{3}) \div (\frac{3}{4})$ and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that $(\frac{2}{3}) \div (\frac{3}{4}) = \frac{8}{9}$ because $\frac{3}{4}$ of $\frac{8}{9}$ is $\frac{2}{3}$. (In general, $(\frac{a}{b}) \div (\frac{c}{d}) = \frac{ad}{bc}$.) How much chocolate will each person get if 3 people share $\frac{1}{2}$ lb of chocolate equally? How many $\frac{3}{4}$ -cup servings are in $\frac{2}{3}$ of a cup of yogurt? How wide is a rectangular strip of land with length $\frac{3}{4}$ mi and area $\frac{1}{2}$ square mi?	7.NS 2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(\frac{p}{q}) = \frac{-p}{q} = \frac{p}{-q}$. Interpret quotients of rational numbers by describing real-world contexts. c. Apply properties of operations as strategies to multiply and divide rational numbers. d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.
D. Solving Problems and Equations			
Solve word problems with multiple steps.	2		4.OA 3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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. 7.NS 3. Solve real-world and mathematical problems involving the four operations with rational numbers.
Solve problems with more than one operation, according to order of operations (with and without a calculator).	2		4.OA 3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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.
IV. Measurement			

Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Solve problems requiring conversion of units within the U. S. Customary System, and within the metric system.	8	6.RP 3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	
Associate prefixes used in metric system with quantities: kilo = thousand hecto = hundred deka = ten deci = tenth centi = hundredth milli = thousandth	8		
Time: solve problems on elapsed time; express parts of an hour in fraction or decimal form.	5, 8		4.MD 2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
V. Geometry			
Identify and use signs that mean congruent \cong similar \sim parallel \parallel perpendicular \perp	2		

Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
<p>Angles:</p> <p>Identify and measure the degrees in angles (review terms: right, acute, obtuse, straight). Bisect an angle. Construct an angle congruent to a given angle. Construct a figure congruent to a given figure, using reflection over a line of symmetry, and identify corresponding parts. Show how congruent plane figures can be made to correspond through reflection, rotation, and translation.</p>	7		<p>4.MD 7. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.</p> <p>8.G 1. Verify experimentally the properties of rotations, reflections, and translations:</p> <ul style="list-style-type: none"> a. Lines are taken to lines, and line segments to line segments of the same length b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines. <p>8.G 4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.</p>
<p>Triangles:</p> <p>Know that the sum of the measures of the angles of a triangle is 180°. Construct different kinds of triangles. Know terms by which we classify kinds of triangles: by length of sides: equilateral, isosceles, scalene by angles: right, acute, obtuse</p>	7		<p>7.G 2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.</p> <p>8.G 5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. <i>For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.</i></p>
<p>Identify congruent angles and sides, and axes of symmetry, in parallelograms, rhombuses, rectangles, and squares.</p>	7		High school

Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
<p>Find the area (A) and perimeter (P) of plane figures, or given the area or perimeter find the missing dimension, using the following formulas:</p> <p>rectangle $A = lw$ $P = 2(l + w)$</p> <p>square $A = s^2$ $P = 4s$</p> <p>triangle $A = \frac{1}{2}bh$ $P = s_1 + s_2 + s_3$</p> <p>parallelogram $A = bh$ $P = 2(b + s)$</p>	2	<p>6.G 1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.</p> <p>6.G 4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.</p>	
<p>Circles:</p> <p>Identify arc, chord, radius (plural: radii), and diameter; know that radius = $\frac{1}{2}$ diameter.</p> <p>Using a compass, draw circles with a given diameter or radius.</p> <p>Solve problems involving application of the formulas for finding the circumference of a circle: $C = \pi d$, and $C = 2\pi r$, using 3.14 as the value of pi.</p> <p>Find the area of a circle using the formula $A = \pi r^2$</p>	5, 7		<p>7.G 4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.</p>

Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Find volume of rectangular solids, or given the volume find a missing dimension, using the formulas $V = lwh$, or $V = bh$ (in which $b =$ area of base).	6, 7, 8	6.G 2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	<p>5. MD 3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement.</p> <p>5.MD 5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.</p> <ul style="list-style-type: none"> 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 the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. b. 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. c. 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.
VI. Probability and Statistics			
Find the range and measures of central tendency (mean, median, and mode) of a given set of numbers.	1, 4	6.SP 3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.	
Understand the differences among the measures of central tendency and when each might be used.	7	<p>6.SP 5. Summarize numerical data sets in relation to their context, such as by:</p> <ul style="list-style-type: none"> d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. 	

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Understand the use of a sample to estimate a population parameter (such as the mean), and that larger samples provide more stable estimates.	4	6.SP 5. c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.	<p>7.SP 1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.</p> <p>7.SP 2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be</p> <p>7.SP 4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.</p>
Represent all possible outcomes of independent compound events in an organized way and determine the theoretical probability of each outcome.	1, 4	<p>6.SP 5 Summarize numerical sets in relation to their context, such as by:</p> <ul style="list-style-type: none"> a. Reporting the number of observations b. Describing the nature of the attribute under investigation, including how it was measured and its unit of measurement. 	<p>7.SP 7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.</p> <ul style="list-style-type: none"> a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected. b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?

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Compute the probability of any one of a set of disjoint events as the sum of their individual probabilities.	1, 4		<p>7.SP 7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.</p> <ul style="list-style-type: none"> a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected. b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies? <p>7.SP 8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.</p> <ul style="list-style-type: none"> a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event. c. Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?
Solve problems requiring interpretation and application of graphically displayed data.	4	6.SP 2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	

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Given a set of data, find the mean, median, range, and mode.	4	6.SP 5. Summarize numerical data sets in relation to their context, such as by: c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.	
Construct a histogram; a tree diagram.	4	6.SP 4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	7.Sp 8 8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
Coordinate plane: Plot points on a coordinate plane, using ordered pairs of positive and negative whole numbers. Use the terms origin (0,0), x-axis, and, y-axis. Graph simple functions and solve problems involving use of a coordinate plane.	4	6.SP 4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots. 6.NS 6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. 6.NS 8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. 6.G 3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	8.F 1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
VII. Pre-Algebra			
Recognize uses of variables and solve linear equations in one variable.	6, 7, 8	6.EE 6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.	8.EE 7. Solve linear equations in one variable. <ul style="list-style-type: none"> a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
Solve word problems by assigning variables to unknown quantities, writing appropriate equations, and solving them.	2, 4	6.EE 2. Write, read, and evaluate expressions in which letters stand for numbers. 6.EE 7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p , q and x are all nonnegative rational numbers.	
Find the value for an expression, given replacement values for the variables; for example, what is $7/x - y$ when x is 2 and y is 10?	8	6.EE 2 Write, read, and evaluate expressions in which letters stand for numbers. <ul style="list-style-type: none"> a. Write expressions that record operations with numbers and with letters standing for numbers. For example, express the calculation “Subtract y from 5” as $5 - y$. c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole- number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$. 	

Core Knowledge Sequence Grade 6	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Simplify expressions with variables by combining like terms.	8	<p>6.EE 2. Write, read, and evaluate expressions in which letters stand for numbers.</p> <p>c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = \frac{1}{2}$.</p>	
Understand the use of the distributive property in variable expressions such as $2x(2y + 3)$.	6, 7, 8	<p>6.EE 3. Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$; apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$; apply properties of operations to $y + y + y$ to produce the equivalent expression $3y$.</p>	<p>7.EE 2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, $a + 0.05a = 1.05a$ means that “increase by 5%” is the same as “multiply by 1.05.”</p> <p>7.SP 3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.</p>

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Core Knowledge Sequence Grade 7	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
I. Pre-Algebra			
A. Properties of the Real Numbers			
Know and use the associative, commutative, and distributive properties by name and in simplifying expressions involving numbers and variables.	6, 7, 8		3.OA 5. Apply properties of operations as strategies to multiply and divide. ² Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)
Understand absolute value and evaluate expressions such as $ 2x - 3 + 3x$.	7		6.NS 7. Understand ordering and absolute value of rational numbers. <ul style="list-style-type: none"> a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. <i>For example interpret $-3 > -7$ as a statement that -3 is located to the right of -7 on a number line oriented from left to right.</i> b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. <i>For example, write $-3^{\circ}\text{C} > -7^{\circ}\text{C}$ to express the fact that -3°C is warmer than -7°C.</i> c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. <i>For example, for an account balance of -30 dollars, write $-30 = 30$ to describe the size of the debt in dollars.</i> d. Distinguish comparisons of absolute value from statements about order. For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.
B. Linear Applications and Proportionality			

Core Knowledge Sequence Grade 7	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Know the concept of slope.	7	<p>7.RP 2 Recognize and represent proportional relationships between quantities.</p> <ul style="list-style-type: none"> a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. c. Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$. d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate. 	
Translate situations of proportionality into equations of the form $y = mx$, where m is the constant of proportionality or slope; specifically know and understand $d = rt$ and $i = prt$.	7	<p>7.RP 2. Recognize and represent proportional relationships between quantities.</p> <ul style="list-style-type: none"> c. Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$. 	
Show situations of constant proportionality as a line on the coordinate plane.	4	<p>7.RP 2. Recognize and represent proportional relationships between quantities.</p> <ul style="list-style-type: none"> a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. 	

Core Knowledge Sequence Grade 7	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Introduce the concept of a function and determine the equation of a linear function given its slope and intercepts in the form $y = mx + b$.	2		<p>8.F.1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.</p> <p>8.F.3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. <i>For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.</i></p>
Estimate the values of b and m from a given linear graph.	4		
C. Polynomial Arithmetic			
Add, subtract, multiply, and divide monomials and polynomials (divide polynomials by monomials only).	1, 4		A-APR. 1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
Factor binomials that have a common monomial factor.	1, 4		A-SSE. 2 Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.
D. Equivalent Equations and Inequalities			

Core Knowledge Sequence Grade 7	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Review equality properties for equations.	7		<p>6.EE 4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions $y + y + y$ and $3y$ are equivalent because they name the same number regardless of which number y stands for.</p> <p>6.EE 5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.</p> <p>A-SSE 3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression</p> <ul style="list-style-type: none"> a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as $(1.151/12)^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.
Know that addition or subtraction of the same value from both sides of an inequality maintains the inequality	7		
Know that multiplying or dividing both sides of an inequality by a positive number maintains the inequality, but multiplying or dividing by a negative number reverses the inequality; be able to show why using a number line.	7		
Simplify and solve linear equations in one variable such as $3(2x - 5) + 4x = 12(x + 5)$.	1, 4		<p>6.EE 6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.</p>

Core Knowledge Sequence Grade 7	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Simplify and graph solutions to linear inequalities in one variable such as $3(2x - 5) + 4x \leq 12(x + 5)$.	8		<p>A-REI. 3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.</p> <p>A-REI. 4 Solve quadratic equations in one variable.</p> <p>a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.</p> <p>b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.</p>
E. Integer Exponents			
Know the meaning of an exponent n when n is positive or negative.	7		
Know that a non-zero number to the zero power is one.	7		
Understand why a negative number to an even power is positive and a negative number to odd power is negative.	7		
Know the multiplication properties of exponents: Product of powers: $(a^m)(a^n) = a^{(m+n)}$ Power of a power: $(a^m)^n = a^{mn}$ Power of a product: $(ab)^n = (a^n)(b^n)$.	7		
Convert decimal numbers to and from scientific notation.	8		<p>8.EE 4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.</p>

Core Knowledge Sequence Grade 7	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Know the proper order of operations with exponents.	7		
II. Geometry			
A. Three-Dimensional Objects			
Describe and construct simple right prisms, cylinders, cones, and spheres using the concepts of parallel and perpendicular; calculate the surface areas and volumes of these objects.	4, 7	7.G 1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	8.G 9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
Know that the section created by the intersection of a plane and a sphere is a circle.	7		
Calculate the surface area of a sphere using the equation $SA = 4\pi r^2$.	2	7.G 1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	
Calculate the volume of a sphere using the equation $V = (4/3)\pi r^3$.	6	7.G 6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	
B. Angle Pairs			
Construct parallel lines and a transversal using a compass and straight edge.	5		G-CO. 12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
Understand congruent angles, vertical angles, complementary angles, supplementary angles, adjacent angles, corresponding angles, and alternate interior and alternate exterior angles	7	7.G 5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	
C. Triangles			

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Know that a triangle is determined by its three sides or by two sides and the included angle (SSS and SAS triangle congruence) and solve problems.	7		G-CO. 8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
Use SSS to prove that the construction of the bisector of an angle is valid.	3		G-CO. 9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
Use SSS to prove that the construction of the perpendicular bisector of a segment is valid.	3		G-CO. 9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
Prove that the base angles of an isosceles triangle are congruent.	3		G-CO. 9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
Demonstrate that the sum of the interior angles of a triangle equals 180 degrees.	3		G-CO. 10 Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180° ; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
Know that the shape of a triangle is determined by two (hence all three) of its angles (AA(A) triangle similarity) and solve related problems.	7		
Construct a circle that circumscribes a triangle using compass and straight edge.	5	7.G 4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	

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Know and understand the Pythagorean Theorem and its converse and use it to find the length of the missing side of a right triangle and lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement and a calculator.	3		8.G 6. Explain a proof of the Pythagorean Theorem and its converse. 8.G 7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
Use the Pythagorean Theorem to determine the exact ratios of the sides in 30-60-right triangles and isosceles right triangles.	7		8.G 7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
Determine the image of a triangle under translations, rotations, and reflections.	7		8.G 3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
D. Measurement			
Choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems.	8	7.RP 1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rate as the complex fraction $\frac{1/2}{1/4}$ miles per hour, equivalently 2 miles per hour.	
Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (for example, miles per hour and feet per second, cubic inches to cubic centimeters).	8		4.MD 1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table. <i>For example, 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), ...</i>

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Use measures expressed as rates (for example, speed, density) and measures expressed as products (for example, person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.	1		6.EE 9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.
Compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects.	1, 4	7.G 6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	
Know how perimeter, area, and volume are affected by changes of scale.	7		
Estimate and compute the area of more complex or irregular two- and three-dimensional figures by breaking the figures down into more basic geometric objects.	4	7.G 3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.	
Relate the changes in measurement with a change of scale to the units used (for example, square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches [$1 \text{ ft}^2 = 144 \text{ in}^2$], 1 cubic inch is approximately 16.38 cubic centimeters [$1 \text{ in}^3 = [16.36 \text{ cm}^3]$]).	8		5.MD 1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.
III. Probability and Statistics			
Show the relationship between two variables using a scatter-plot and describe the apparent relationship informally.	3, 4		8.SP1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

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Find the upper and lower quartiles for a data set.	2, 4		S-ID. 2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
Understand that if p is the probability of an event occurring, $1 - p$ is the probability of the event not occurring.	7	7.SP 5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around $1/2$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	7.SP 5.
Understand the difference between independent and dependent events.	7		S-CP 2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

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I. Algebra			
A. Properties of the Real Numbers			
Be able to raise a positive number to a fractional power and simplify appropriately, including rationalizing the denominator of a simple radical expression.	8		N-RN 1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5
Know and use of the rules of exponents extended to fractional exponents.	7	8.EE 1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.	
Use the definition of absolute value to solve equations such as $ 2x - 3 + 3x = 4x - 2$ and understand why “extraneous solutions” are not solutions at all.	7		6.NS 7. Understand ordering and absolute value of rational numbers. a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. <i>For example, interpret $-3 > -7$ as a statement that -3 is located to the right of -7 on a number line oriented from left to right.</i> b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write $-3^\circ\text{C} > -7^\circ\text{C}$ to express the fact that -3°C is warmer than -7°C . A-REI. 2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
B. Relations, Functions, and Graphs (Two Variables)			
Be able to plot a set of ordered pairs and surmise a reasonable graph of which the points are a part.	4	8.EE 5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.	

Core Knowledge Sequence Grade 8	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
Be able to make a reasonable table of ordered pairs from a given function rule, plot the points, and surmise its graph.	4	8.F 2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.</i>	
Know that the points of intersections of two graphs are simultaneous solutions of the relations that define them and indicate approximate numerical solutions.	7	8.EE 8 Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. c. Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair	
C. Linear Equations and Functions (Two Variables)			
Graph linear equations by finding the x- and y-intercepts; for example, know that $2x + 3y = 4$ is linear and graph it using its intercepts.	7		F—IF. 7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
Be able to convert between slope-intercept form ($y = mx + b$) and standard form ($ax + by = c$).	8	8.F 3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.	
Write an equation for a line given two points or one point and its slope.	8		

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Know lines are parallel or perpendicular from their slopes.	7		G-CO 1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
Find the equation of a line perpendicular to a given line that passes through a given point.	4		G-GPE. 5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
Understand and be able to graph the solution set of a linear inequality.	4		A-REI 12 Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
Solve a system of two linear equations in two variables algebraically and interpret the answer graphically.	2, 4	8.EE 8 Analyze and solve pairs of simultaneous linear equations. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.	

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Solve a system of two linear inequalities in two variables and sketch the solution set.	2, 4	<p>8.F 2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.</p> <p>8.F 4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p> <p>8.F 5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally</p>	

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Solve word problems (including mixture, digit, and age problems) that involve linear equations.	2, 4	<p>8.SP 2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.</p> <p>8.SP 3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.</p> <p>8.SP 4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?</p>	
D. Arithmetic of Rational Expressions			
Factor second- and higher-degree polynomials when standard techniques apply, such as factoring the GCF out of all terms of a polynomial, the difference of two squares, and perfect squares trinomials.	8		<p>A-APR 2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.</p> <p>A-APR 3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.</p>

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Add, subtract, multiply, and divide rational expressions and express in simplest form.	1, 4	<p>8.NS 1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.</p> <p>8.NS 2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.</p>	7.EE 1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
E. Quadratic Equations and Functions			
Solve quadratic equations in one variable by factoring or by completing the square.	1, 2, 4		N-CN. 7 Solve quadratic equations with real coefficients that have complex solutions.
Complete the square to write a quadratic expression as the difference of two squares.	1, 4		<p>A-SSE 3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <ol style="list-style-type: none"> Factor a quadratic expression to reveal the zeros of the function it defines. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. Use the properties of exponents to transform expressions for exponential functions. For example the expression $1.15t$ can be rewritten as $(1.151/12)12t \approx 1.01212t$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.
Graph quadratic functions by completing the square to find the vertex and know that their zeros (roots) are the x-intercepts.	7		

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<p>Know the quadratic formula and be familiar with its proof by completing the square.</p>	<p>7</p>		<p>A-SSE 3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <ul style="list-style-type: none"> a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. For example the expression $1.15t$ can be rewritten as $(1.151/12)^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.
<p>Know how to clear fractions to solve equations that lead to linear or quadratic equations.</p>	<p>8</p>		<p>A-SSE 3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <ul style="list-style-type: none"> a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. For example the expression $1.15t$ can be rewritten as $(1.151/12)^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.
<p>Know how to use squaring to solve problems that lead to linear or quadratic equations.</p>	<p>8</p>		<p>A-SSE 3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <ul style="list-style-type: none"> a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. For example the expression $1.15t$ can be rewritten as $(1.151/12)^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.

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Solve word problems, including physical problems such as the motion of an object under the force of gravity, and combined rate (work) problems.	2, 4		
II. Geometry			
A. Analytic Geometry			
Reinforce the knowledge of algebra with geometry and vice versa.	1		
Know that the midpoint of a line segment of any slope, projected perpendicularly onto the horizontal x-axis or vertical y-axis, will be the midpoint of its projection.	7		N-CN 6. (+) Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.
Know the similar triangles connection (AA Similarity) with slope and that this is the tangent of the angle the line makes with the x-axis.	7	8.EE 6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b .	
B. Introduction to Trigonometry			
Know that in a right triangle the cosine of an angle is the ratio of the adjacent side to the hypotenuse and the sine is the ratio of the opposite side to the hypotenuse.	7		G-SRT 7. Explain and use the relationship between the sine and cosine of complementary angles.
Know the values of the sine, cosine, and tangent of 0, 30, 45, 60, and 90 degrees and use a scientific calculator to determine the approximate value of any acute angle.	7		G-SRT 7. Explain and use the relationship between the sine and cosine of complementary angles. G-SRT 10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.
Use a scientific calculator to determine the approximate value of an acute angle of a given sine, cosine, or tangent.	5		F-TF 9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. G-SRT 7. Explain and use the relationship between the sine and cosine of complementary angles.

Core Knowledge Sequence Grade 8	CCSS MP	Common Core State Standards covered at CK Grade Level	Common Core State Standards covered above or below CK Grade Level
C. Triangles and Proofs			
Prove that the bisector of an angle is the set of all points equidistant from both sides.	3		G-CO 9. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
Prove that any triangle inscribed in a circle with one side as the diameter is a right triangle.	3		G-CO 10. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180° ; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
Prove the Pythagorean Theorem.	3	8.G 6. Explain a proof of the Pythagorean Theorem and its converse. 8.G 7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. 8.G 8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	
Know that a line tangent to a circle is perpendicular to the radius at the point of tangency.	7		
Taking geometry as a model, understand the concept of a mathematical proof, as distinct from an opinion, an approximation, or a conjecture based on specific cases.	3	8.G 6. Explain a proof of the Pythagorean Theorem and its converse	
In geometry and elsewhere, understand that a single-counter example suffices to disprove a general assertion.	3		