South Carolina College- and Career-Ready Standards for Mathematics

Standards Unpacking Documents

1st Grade

South Carolina College- and Career-Ready Standards for Mathematics
1st Grade Mathematics Standards Unpacking Document

With the final approval of the *South Carolina College- and Career-Ready Standards for Mathematics* on March 11, 2015, educators were provided with clear, rigorous, and coherent standards for mathematics that would prepare students for success in their intended career paths that will either lead directly to the workforce or further education in post-secondary institutions. *South Carolina College- and Career-Ready Standards for Mathematics* contains South Carolina College- and Career-Ready (SCCCR) Content Standards for Mathematics that represent a balance of conceptual and procedural knowledge and specify the mathematics that students will master in each grade level and high school course.

The State Department of Education released Support Documents throughout the 2015-2016 school year to provide support for educators who are implementing the *South Carolina College- and Career-Ready Standards for Mathematics*. The Support Documents, which are organized by grades, are then organized by possible units of study which address all of the standards for that grade. The Support Documents can be found at http://ed.sc.gov/instruction/standards-learning/mathematics/support-documents-and-resources/. The purpose of these documents is to provide guidance as to how all the standards at each grade may be grouped into units. Since these documents are merely guidance, the State Department of Education encourages districts to implement the standards in a manner that best meets the needs of students.

To provide an additional supportive resource for South Carolina mathematics educators and continue to build upon the work of the State Department of Education, the South Carolina Leaders of Mathematics Education organization offered to create grade specific Standards Unpacking Documents. These documents would be organized by grade level and grouped by key concept. The *South Carolina College- and Career-Ready Standards for Mathematics* and the South Carolina grade specific Mathematics Support Documents as well as North Carolina and Kansas resources were utilized in the creation of the grade specific Standards Unpacking Documents. This document was adapted and modified specifically from the North Carolina Department of Education grade specific Mathematics Unpacked Content resources as well as the Kansas Association of Teachers of Mathematics Flip Books.

The Mathematics Standards Unpacking Documents were collaboratively written by South Carolina classroom teachers, instructional coaches, district leaders, and higher education faculty who are members of the South Carolina Leaders of Mathematics Education. It is with sincere appreciation that we humbly acknowledge the dedication, hard work and generosity of time provided by the members of the South Carolina Leaders of Mathematics Education who made the Mathematics Standards Unpacking Documents possible.

The primary purpose and goal of the Mathematics Standards Unpacking Documents are to assist and support educators who are teaching the *South Carolina College- and Career-Ready Standards for Mathematics* and to increase student achievement by ensuring educators understand specifically what the standards mean a student must know, understand and be able to do. These documents may also be used to facilitate discussion among teachers and curriculum staff and to encourage coherence in the sequence, pacing, and units of study for grade-level curricula. These documents, along with on-going professional development, may be one of many resources used to understand and teach *South Carolina College- and Career- Ready Standards for Mathematics*.

South Carolina College- and Career-Ready Standards for Mathematics
Mathematical Process Standards

The South Carolina College- and Career-Ready (SCCCR) Mathematical Process Standards demonstrate the ways in which students develop conceptual understanding of mathematical content and apply mathematical skills. As a result, the SCCCR Mathematical Process Standards should be integrated within the SCCCR Standards for Mathematics for each grade level and course. Since the Process Standards drive the pedagogical component of teaching and serve as the means by which students should demonstrate understanding of the Content Standards, the Process standards must be incorporated as an integral part of overall student expectations when assessing content understanding.

Students who are college- and career-ready take a productive and confident approach to mathematics. They are able to recognize that mathematics is achievable, sensible, useful, doable, and worthwhile. They also perceive themselves as effective learners and practitioners of mathematics and understand that a consistent effort in learning mathematics is beneficial.

The Program for International Student Assessment defines mathematical literacy as “an individual’s capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena. It assists individuals to recognize the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective citizens” (Organization for Economic Cooperation and Development, 2012).

A mathematically literate student can:

1. **Make sense of problems and persevere in solving them.**
    a. Relate a problem to prior knowledge.
    b. Recognize there may be multiple entry points to a problem and more than one path to a solution.
    c. Analyze what is given, what is not given, what is being asked, and what strategies are needed, and make an initial attempt to solve a problem.
    d. Evaluate the success of an approach to solve a problem and refine it if necessary.

2. **Reason both contextually and abstractly.**
    a. Make sense of quantities and their relationships in mathematical and real-world situations.
    b. Describe a given situation using multiple mathematical representations.
    c. Translate among multiple mathematical representations and compare the meanings each representation conveys about the situation.
    d. Connect the meaning of mathematical operations to the context of a given situation.

3. **Use critical thinking skills to justify mathematical reasoning and critique the reasoning of others.**
    a. Construct and justify a solution to a problem.
    b. Compare and discuss the validity of various reasoning strategies.
    c. Make conjectures and explore their validity.
    d. Reflect on and provide thoughtful responses to the reasoning of others.

4. **Connect mathematical ideas and real-world situations through modeling.**
    a. Identify relevant quantities and develop a model to describe their relationships.
    b. Interpret mathematical models in the context of the situation.
    c. Make assumptions and estimates to simplify complicated situations.
    d. Evaluate the reasonableness of a model and refine if necessary.

5. **Use a variety of mathematical tools effectively and strategically.**
    a. Select and use appropriate tools when solving a mathematical problem.
    b. Use technological tools and other external mathematical resources to explore and deepen understanding of concepts.

6. **Communicate mathematically and approach mathematical situations with precision.**
    a. Express numerical answers with the degree of precision appropriate for the context of a situation.
    b. Represent numbers in an appropriate form according to the context of the situation.
    c. Use appropriate and precise mathematical language.
    d. Use appropriate units, scales, and labels.

7. **Identify and utilize structure and patterns.**
    a. Recognize complex mathematical objects as being composed of more than one simple object.
    b. Recognize mathematical repetition in order to make generalizations.
    c. Look for structures to interpret meaning and develop solution strategies.

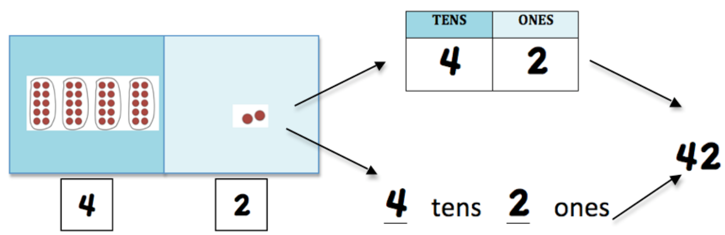
Number Sense and Base Ten 1.NSBT

Overview

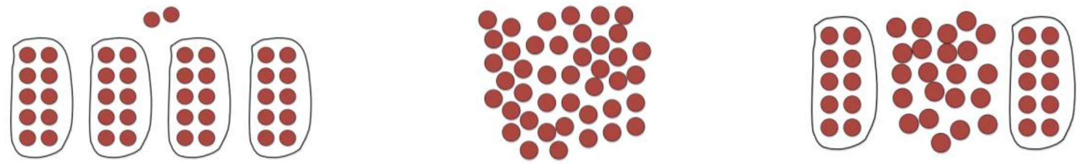
Students develop, discuss, and use efficient, accurate, and generalizable methods to add within 100 and subtract multiples of 10. They verbally compare whole numbers (at least to 100) to develop understanding of and solve problems involving their relative sizes. They think of whole numbers between 10 and 100 in terms of tens and ones (especially recognizing the numbers 11 to 19 as composed of a ten and some ones). Through activities that build on Kindergarten number sense, they deepen their understanding of the order of the counting numbers by extending counting to 120. That understanding includes the relative magnitude of numbers beyond 100 and the relationship between groups as they count by fives and tens.

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision are: number words *(*reading and writing **zero through nineteen and multiples of ten through ninety in word form and reading, writing and representing numbers to 100), tens, ones, bundle, leftovers, groups, greater than, less than, equal to, compare, add, subtract, reason, more, less.**

SCCCR Standard	**Unpacking** What do these standards mean a child will know and be able to do?
1.NSBT.1 Extend the number sequence to: a. count forward by ones to 120 starting at any number; b. count by fives and tens to 100, starting at any number; c. read, write and represent numbers to 100 using concrete models, standard form, and equations in expanded form; d. read and write in word form numbers zero through nineteen, and multiples of ten through ninety.	Students rote count forward to 120 by counting on from any number less than 120. Students should have ample experiences with the hundreds chart to see number patterns. For example, all of the numbers in a column on the hundreds chart have the same digit in the ones place, and all of the numbers in a row have the same digit in the tens place. Students develop accurate counting strategies that build on the understanding of how the numbers in the counting sequence are related—each number is one more (or one less) than the number before (or after). Students will also count by 5s (using multiples of 5 only) to 100 (e.g., 40, 45, 50, 55…) and by 10s from any number to 100 (e.g., 36, 46, 56, 66, …). One purpose for counting by groups (“unitizing”) is to make counting more efficient. As students learn to understand that the position of each digit in a number impacts the quantity of the number, they become more aware of the order of the digits when they write numbers. For example, a student may write “17” and mean “71”. Additional instruction related to place value would be needed. Teachers can demonstrate opportunities to find mistakes by questioning students about their thinking. Example: **Comparing 19 to 91** 19 91 **Teacher:** Are these numbers the same or different? **Students:** Different! **Teacher:** Why do you think so? **Students:** Even though they both have a one and a nine, the top one is nineteen. The bottom one is ninety-one. **Teacher:** Is that true some of the time, or all of the time? How do you know? Teacher continues discussion.

	In addition, students read and write numerals to represent a given amount up to 100 using concrete models (e.g., 28 counters), standard form (e.g., 28), and equations in expanded form (e.g., 20 + 8 = 28). These representations may include cubes, place value base-10 blocks, pictorial representations or other concrete materials. Students should use objects, words, and symbols to demonstrate their understanding of numbers. Finally, students will read and write in word form numbers zero through nineteen, and multiples of ten through ninety. The intent is to introduce students to the word form and connect its meaning to the numeral. These are not intended to become spelling words.
1.NSBT.2 Understand place value through 99 by demonstrating that: a. ten ones can be thought of as a bundle (group) called a "ten"; b. the tens digit in a two-digit number represents the number of tens and the ones digit represents the number of ones; c. two-digit numbers can be decomposed in a variety of ways (e.g., 52 can be decomposed as 5 tens and 2 ones or 4 tens and 12 ones, etc.) and record the decomposition as an equation.	Students are introduced to the idea that a bundle (group) of ten ones is called "a ten". This is known as unitizing because the bundle with which students are working should be viewed as a unit – not discrete items in the bundle. When first grade students unitize a group of ten ones as a whole unit ("a ten"), they are able to count groups as though they were individual objects. For example, 4 trains of ten cubes each have a value of 10 and would be counted as 40 rather than as 4. This is a monumental shift in thinking, and can often be challenging for young children to consider a group of something as "one" when all previous experiences have been counting single objects. This is the foundation of the place value system and requires time and rich experiences with concrete manipulatives to develop.  A student's ability to conserve number is an important aspect of this standard. It is not obvious to young children that 42 cubes is the same amount as 4 tens and 2 leftovers (ones). It is also not obvious that 42 could also be composed of 2 groups of 10 and 22 leftovers (ones). Therefore, students require ample time grouping proportional objects (e.g., cubes, beans, beads, ten-frames) to make groups of ten, rather than using pre-grouped materials (e.g., base ten blocks) that have to be "traded" or are non-proportional (e.g., money). Students need ample experiences with a variety of groupable materials that are proportional, and ten frames allow students opportunities to create tens and break apart tens, rather than "trade" one for another. Since students primarily rely on counting when first learning about place value concepts, the physical opportunity to build tens helps them to "see" that a "ten stick" has "ten items" within it. Pre-grouped materials (e.g., base ten blocks) are not introduced or used until a student has a firm understanding of composing and decomposing tens. (Van de Walle & Lovin, 2006)

Example: **42 cubes can be grouped many different ways and still remain a total of 42 cubes.**

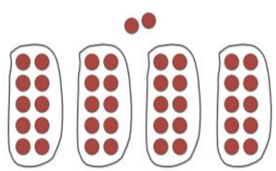


"We want children to construct the idea that all of these are the same and that the sameness is clearly evident by virtue of the groupings of ten. Groupings by tens is not just a rule that is followed but that any grouping by tens, including all or some of the singles, can help tell how many." (Van de Walle & Lovin, p. 124)

As children build this understanding of grouping, they move through several stages:
Counting By Ones, Counting by Groups & Singles, and **Counting by Tens and Ones**.

Counting By Ones:
At first, even though First Graders will have grouped objects into tens and leftovers, they rely on counting all of the individual cubes by ones to determine the final amount. It is seen as the only way to determine how many.

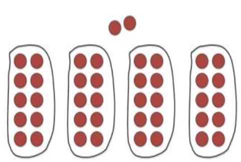
Example:



Teacher: How many counters do you have?
Student: 1, 2, 3, 4, …. 41, 42. I have 42 counters.

Counting By Groups and Singles:
While students are able to group objects into collections of ten and now tell how many groups of tens and leftovers (ones) there are, they still rely on counting by ones to determine the final amount. They are unable to use the groups and leftovers to determine how many.

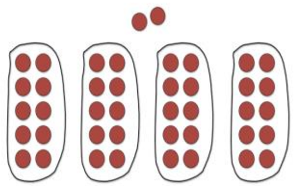
Example:



Teacher: How many counters do you have?
Student: I have 4 groups of ten and 2 left-overs.
Teacher: Does that help you know how many? How many do you have?
Student: Let me see. 1, 2, 3, 4,…. 41, 42. I have 42 counters.

Counting by Tens & Ones:
Students are able to group objects into ten and ones, tell how many groups and leftovers there are, and now use that information to tell how many. Ex: "I have 4 groups of ten and 2 leftovers. That means that there are 42 cubes in all." Occasionally, as this stage is becoming fully developed, students rely on counting by ones to "really" know that there are 42, even though they may have just counted the total by groups and leftovers (ones).

<u>Example:</u>



Teacher: How many counters do you have?
Student: I have 4 groups of ten and 2 leftovers.
Teacher: Does that help you know how many? How many do you have?
Student: Yes. That means that I have 42 counters.
Teacher: Are you sure?
Student: Um. Let me count just to make sure… 1, 2, 3, 4,… 41, 42. Yes. I was right. There are 42 counters.

Students also extend their work from kindergarten when they composed and decomposed numbers from 11 to 19 into ten ones and some further ones. In kindergarten, everything was thought of as individual units: "ones". Now students are asked to think of those ten individual ones as a whole unit: "one ten". Students explore the idea that teen numbers (11 to 19) can be expressed as one ten and some leftover ones. Ample experiences with ten frames will help develop this concept. Once developed, this concept builds to two-digit numbers through 99 with the understanding that the digit in the tens place represents the number of tens and the digit in the ones place represents the number of ones. Students can demonstrate any number of objects up to 99 by making bundles (groups) of ten with or without leftovers (ones).

Finally students demonstrate the decomposition of two-digit numbers in a variety of ways and record by using an equation. For example, 52 can be recorded as 52 = 50 +2 or 52 = 40 + 12. Teachers may want to have students represent decomposition with concrete models and drawings.

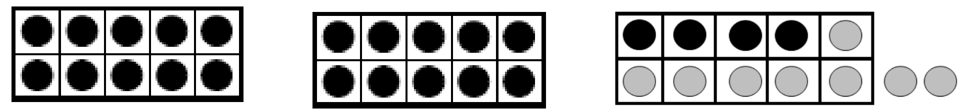
1.NSBT.3 Compare two two-digit numbers based on the meanings of the tens and ones digits, using the words *greater than*, *equal to*, or *less than.*	Students use their understanding of groups and order of digits to compare two numbers by examining the amount of tens and ones in each number. Students may use pictures, number paths, and spoken or written words (i.e., greater than, equal to, less than) to compare two two-digit numbers. Students are not expected to use symbols (>, <, =) in first grade. One strategy students may use for comparison of two two-digit numbers would be to identify which two tens any number within 100 falls by using an open number line to plot each number in order to explain between which two tens the number falls. To integrate measurement, include temperature examples with comparison of two-digit numbers in which temperatures are provided by the teacher since students have not learned to read a thermometer – perhaps the teacher records the temperature daily and applies it in context for the students. <u>Example:</u> **Compare these two numbers. 42 __ 45** **Student A** 42 has 4 tens and 2 ones. 45 has 4 tens and 5 ones. They have the same number of tens, but 45 has more ones than 42. So, 42 is less than 45. **Student B** 42 is less than 45. I know this because when I count up I say 42 before I say 45.
1.NSBT.4 Add through 99 using concrete models, drawings, and strategies based on place value to: a. add a two-digit number and a one-digit number, understanding that sometimes it is necessary to compose a ten (regroup); b. add a two-digit number and a multiple of 10.	Students use concrete materials, models, drawings and strategies based on place value to add through 99. They do so by being flexible with numbers as they use the base-ten system to solve problems. When adding a two-digit number and a one-digit number, students should understand that sometimes it is necessary to compose a ten (regroup). Strategies such as partial sums may help emphasize the composition of the ten. The standard algorithm of addition in which students "carry" a ten is neither an expectation nor a focus in first grade. Students extend their number fact and place value strategies when adding through 99. They can represent a problem situation using any combination of words, numbers, pictures, physical objects or symbols. It is important for students to understand that when they are adding a two-digit number to a number that is a multiple of ten, they will have more tens than when they started. Also, when a two-digit number with a value greater than zero in the ones place is added to a one-digit number greater than zero, they will have more 1s than when they started. Students should be exposed to problems both in and out of context and presented in horizontal and vertical forms. As students are solving problems, it is important that they use language associated with proper place value. Students should be encouraged to explain and justify their mathematical thinking both verbally and in written format which includes drawings. Estimating the sum prior to finding the answer focuses students on the meaning of the operation and helps them attend to the actual quantities. The intent of the standard is to focus on the development of addition, not to introduce standard/traditional algorithms or rules. Students use multiple strategies to add and subtract in grades K-3 and are expected to fluently add and subtract multi-digit whole numbers using a standard algorithm by the end of Grade 4.

Example: **24 red apples and 8 green apples are on the table. How many apples are on the table?**

Student A:
I used ten frames. I put 24 chips on 3 ten frames. Then, I counted out 8 more chips. 6 of them filled up the third ten frame. That meant I had 2 left over. 3 tens and 2 left over. That's 32. So, there are 32 apples on the table.

24 + 6 = 30

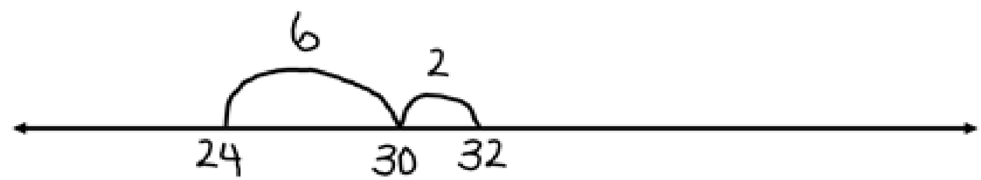
30 + 2 = 32



Student B:
I used an open number line. I started at 24. I knew that I needed 6 more jumps to get to 30. So, I broke apart 8 into 6 and 2. I took 6 jumps to land on 30 and then 2 more. I landed on 32. So, there are 32 apples on the table.

24 + 6 = 30

30 + 2 = 32



Student C:
I turned 8 into 10 by adding 2 because it's easier to add.
So, 24 and ten more is 34.
But, since I added 2 extra, I had to take them off again.
34 minus 2 is 32. There are 32 apples on the table.

8 + 2 = 10

24 + 10 = 34

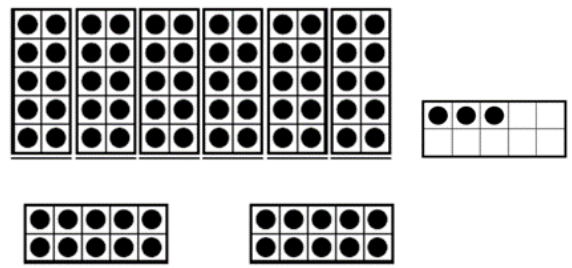
34 – 2 = 32

<u>Example:</u> **63 apples are in the basket. Mary put 20 more apples in the basket. How many apples are in the basket?**

Student A:
I used ten frames. I picked out 6 filled ten frames. That's 60. I got the ten frame with 3 on it. That's 63. Then, I picked one more filled ten frame for part of the 20 that Mary put in. That made 73. Then, I got one more filled ten frame to make the rest of the 20 apples from Mary. That's 83. So, there are 83 apples in the basket.

63 + 10 = 73

73 + 10 = 83



Student B:
I used a hundreds chart. I started at 63 and jumped down one row to 73. That means I moved 10 spaces. Then, I jumped down one more row (that's another 10 spaces) and landed on 83. So, there are 83 apples in the basket.

63 + 10 = 73

73 + 10 = 83

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Student C:
I knew that 10 more than 63 is 73. And 10 more than 73 is 83. So, there are 83 apples in the basket.

63 + 10 = 73

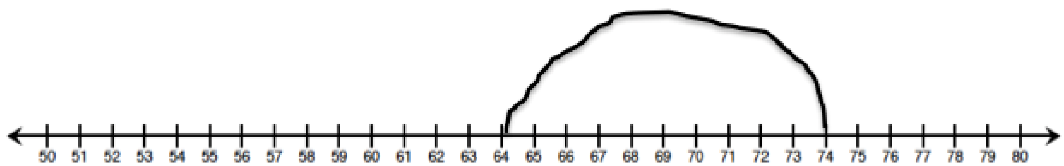
73 + 10 = 83

1.NSBT.5 Determine the number that is 10 more or 10 less than a given number through 99 and explain the reasoning verbally and with multiple representations, including concrete models.

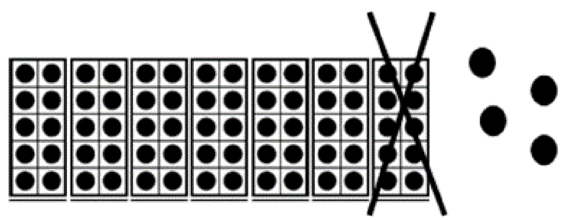
Students build on their work from kindergarten by mentally finding ten more and ten less than any number less than 100. In Kindergarten they developed number sense by examining the relationship between two adjacent numbers – for example, 3 is one more than 2 and 2 is one less than 3. Using that same relational reasoning, first grade students should begin to understand the relationship between groups of 10 – 30 as one group of ten more than 20 and 20 is one group of ten less than 30. Students are not expected to compute differences of two-digit numbers other than multiples of ten and even then the “computation” should be through reasoning based on number relationships rather than in the traditional sense of an algorithm. Teachers may want to begin using concrete models as well as linear models such as a number line or a hundreds board to assist students as they learn the number pattern relationships. There are pitfalls of using a horizontal hundreds board, such as when you add 10, the value goes up but you move down on the board. As students learn the relationship, they should be able to mentally determine the number without physical models. Ample experiences with ten frames and the number line provide students with opportunities to think about groups of ten, moving them beyond simply rote counting by tens on and off the decade. Students should be encouraged to share their process and strategy in finding the number.

<u>Example:</u> **There are 74 birds in the park. 10 birds fly away. How many birds are in the park now?**

Student A
I thought about a number line. I started at 74. Then, because 10 birds flew away, I took a leap of 10. I landed on 64. So, there are 64 birds left in the park.



Student B
I pictured 7 ten frames and 4 left over in my head. Since 10 birds flew away, I took one of the ten frames away. That left 6 ten frames and 4 left over. So, there are 64 birds left in the park.



Student C
I know that 10 less than 74 is 64. So there are 64 birds in the park.

1.NSBT.6 Subtract a multiple of 10 from a larger multiple of 10, both in the range 10 to 90, using concrete models, drawings, and strategies based on place value.

Students use concrete models, drawings and strategies based on place value to subtract a multiple of 10 from a larger multiple of 10, both in the range 10 to 90. Students should have multiple experiences representing numbers that are multiples of 10 (e.g., 70) with models or drawings. Then they subtract a smaller multiple of 10 (e.g., 40) using these representations or strategies based on place value. These opportunities develop fluency of addition and subtraction facts and reinforce counting up and back by 10s.

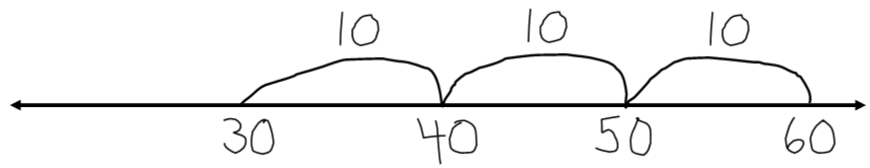
<u>Example:</u> **There are 60 students in the gym. 30 students leave. How many students are still in the gym?**

Student A
I used a number line. I started at 60 and moved back 3 jumps of 10 and landed on 30. There are 30 students left.

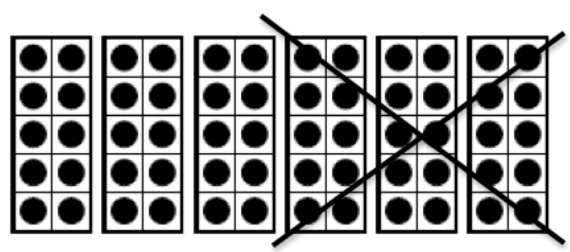
60 – 10 = 50

50 – 10 = 40

40 – 10 = 30



Student B
I used ten frames. I had 6 ten frames- that’s 60. I removed three ten frames because 30 students left the gym. There are 30 students left in the gym.



60 – 30 = 30

Student C
I thought, “30 and what makes 60?” I know 3 and 3 is 6. So, I thought that 30 and 30 makes 60. There are 30 students still in the gym.

30 + 30 = 60

Algebraic Thinking and Operations 1.ATO

Overview

Students should use spoken words, concrete objects, drawings such as tape diagrams, pictorial models, length-based models (i.e., connecting cubes), number lines, and number sentences to solve story problems involving strategies of adding to, taking from, putting together, taking apart, and comparing, with the unknown as any one of the terms. Students understand that the equal sign represents a relationship where expressions on either side of the equal sign represent the same value. They use number sense as well as concrete and pictorial models such as number lines, while identifying the missing whole numbers. Students may use a variety of basic fact strategies such as composing a 10 and decomposing a number leading to 10. Students should explain the problem-solving strategy with spoken words, concrete objects, pictorial models, and number sentences. Students understand connections between counting and addition and subtraction (e.g., adding two is the same as counting on two). They use properties of addition to add whole numbers and to create and use increasingly sophisticated strategies based on these properties (e.g., "making tens") to solve addition and subtraction problems within 20. By comparing a variety of solution strategies, children build their understanding of the relationship between addition and subtraction. By the end of first grade, students will demonstrate fluency for addition and subtraction within 10. Fluency describes a student's ability to compute with accuracy, flexibility, and efficiency. Patterns are found in all areas of mathematics. Learning to search for patterns and how to describe, translate, and extend them is part of doing mathematics and thinking algebraically which lays the foundation for later grades when students will create function tables and generalize rules and patterns. (Van de Walle, 2013)

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision are: **add, adding to, taking from, putting together, taking apart, comparing, unknown, sum, less than, equal to, minus, subtract, the same amount as, and (to describe (+) symbol), counting on, making ten, doubles, equation, unknown addend, order, first, second, difference, part-part-whole addition, putting together, taking from, equivalent, counting all, counting back, the same amount/quantity as, true, growing, pattern, core, increasing, decreasing, symbols such as +, -, =.**

NOTE: *Subtraction names a missing part. Therefore, the minus sign should be read as "minus" or "subtract" but not as "take away". Although "take away" has been a typical way to define subtraction, it is a narrow and incorrect definition.* (Fosnot & Dolk, 2001; Van de Walle & Lovin, 2006)

SCCCR Standard	Unpacking What do these standards mean a child will know and be able to do?
1.ATO.1 Solve real-world /story problems using addition (as a joining action and as a part-part-whole action) and subtraction (as a separation action, finding parts of the whole, and as a comparison) through 20 with unknowns in all positions.	Students should use spoken words, concrete objects, drawings such as tape diagrams, pictorial models, length-based models (i.e., connecting cubes), number lines, and number sentences to solve story problems involving strategies of adding to, taking from, putting together, taking apart, and comparing, with the unknown as any of the terms such as $2 + 4 = \square$; $3 + \square = 7$; and $5 = \square - 3$. Students may use a variety of basic fact strategies such as composing a 10 and decomposing a number leading to 10. Students should explain the problem-solving strategy with spoken words, concrete objects, pictorial models, and number sentences. Addition and subtraction have been separated into four categories: join problems, part-part-whole problems, separate problems, and compare problems. Each category has three numbers, and any one of the three numbers can be the unknown in a story problem. Joining action involves three quantities: an initial amount, a change amount (the part being added or joined), and the resulting amount (the amount after the action is over). Part-Part-Whole action involves two parts that are combined into one whole. There is no meaningful distinction between the two parts with a part-part-whole situation, so there is no need to have a different problem for each part when it is one of the unknowns**.** Separation action

involves three quantities: the initial amount as the whole or the largest amount, a change, and result amount. Compare action involves the comparison of two quantities and the third amount is the difference between the two amounts. (Adapted from Van de Walle)

Kindergarten students focused on solving the following problem types:

- Add To/Joining – Result Unknown
- Take From/Separating – Result Unknown
- Part – Part- Whole – Total Unknown
- Part – Part – Whole – Both Addends Unknown

First grade students extend their experiences from Kindergarten by working with numbers to 20 to solve a new type of problem situation: Comparison (See the table at the end of Unpacking Document to view all problem types.) In a Comparison situation, two amounts are compared to find "How many more" or "How many less".

Problem Type: Comparison		
Difference Unknown: *"How many more?" version.* Lucy has 7 apples. Julie has 9 apples. How many more apples does Julie have than Lucy?	*Bigger* Unknown: *"More" version suggests operation.* Julie has 2 more apples than Lucy. Lucy has 7 apples. How many apples does Julie have?	Smaller Unknown: *Version with "more"* Mastery expected in Second Grade
"How many fewer?" version Lucy as 7 apples. Julie has 9 apples. How many fewer apples does Lucy have than Julie? $7 + \square = 9$ $9 - 7 = \square$	Bigger Unknown: *Version with "fewer"* Mastery expected in Second Grade	*Smaller* Unknown: *"Fewer" version suggests operation.* Lucy has 2 fewer apples than Julie. Julie has 9 apples. How many apples does Lucy have?

Comparison problems are more complex than those introduced in Kindergarten. In order to solve comparison problem types, First Graders must think about a quantity that is not physically present and must conceptualize that amount. In addition, the language of "how many more" often becomes lost or not heard with the language of "who has more". Rich experiences that encourage students to match problems with objects and drawings can help students master these challenges.

First Graders are expected to master the types taught previously in Kindergarten as well as the following types.

- Add To/ Joining – Result Unknown
- Take From/ Separating – Change Unknown
- Part-Part-Whole – Addend Unknown
- Comparison – Difference Unknown (with more and less)
- Comparison – Bigger Unknown
- Comparison – Smaller Unknown

First Graders also extend the sophistication of the methods they used in Kindergarten (counting) to add and subtract within this larger range. Now, First Grade students use the methods such as counting on, making ten, and doubles +/- 1 or +/- 2 to solve problems.

Example: **Nine bunnies were sitting on the grass. Some more bunnies hopped there. Now, there are 13 bunnies on the grass. How many bunnies hopped over there?**	
Counting On Method	**Student**: Nine …. *holding a finger for each next number counted* 10, 11, 12, 13. *Holding up her four fingers*, 4! 4 bunnies hopped over there.
Example**: 8 red apples and 6 green apples are on the tree. How many apples are on the tree?**	
Making Tens Method	**Student**: I broke up 6 into 2 and 4. Then, I took the 2 and added it to the 8. That's 10. Then I add the 4 to the 10. That's 14. So there are 14 apples on the tree.
Example: **13 apples are on the table. 6 of them are red and the rest are green. How many apples are green?**	
Doubles +/- 1 or 2	**Student**: I know that 6 and 6 is 12. So, 6 and 7 is 13. There are 7 green apples.

In Kindergarten, students demonstrated the understanding of how objects can be joined (addition) and separated (subtraction) by representing addition and subtraction situations using objects, pictures and words.

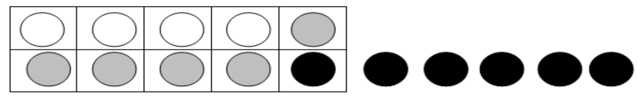
In First Grade, students extend this understanding of addition and subtraction situations to use the addition symbol (+) to represent joining situations, the subtraction symbol (-) to represent separating situations, and the equal sign (=) to represent a relationship regarding quantity between one side of the equation and the other.

1.ATO.2 Solve real-world/story problems that include three whole number addends whose sum is less than or equal to 20.	First Grade students solve problems by adding (joining) three numbers whose sum is less than or equal to 20, using a variety of mathematical representations such as concrete objects, pictorial models, and number sentences. This standard connects to applying the Associative Property of Addition which is taught in 1.ATO.3.

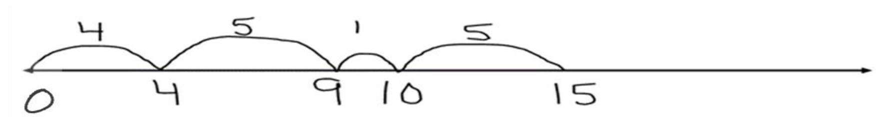
<u>Example:</u> **Mrs. Smith has 4 oatmeal raisin cookies, 5 chocolate chip cookies, and 6 gingerbread cookies. How many cookies does Mrs. Smith have?**

Student A:
I put 4 counters on the Ten Frame for the oatmeal raisin cookies. Then, I put 5 different color counters on the ten frame for the chocolate chip cookies. Then, I put another 6 color counters out for the gingerbread cookies. Only one of the gingerbread cookies fit, so I had 5 leftover. Ten and five more makes 15 cookies. Mrs. Smith has 15 cookies.

4 + 5 + 6 = ☼



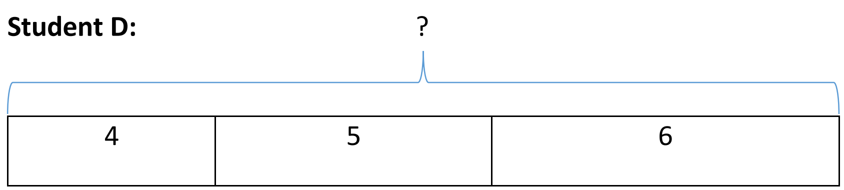
Student B:
I used a number line. First I started at 0 and jumped to 4. Then I jumped 5 more. That's 9. I broke up 6 into 1 and 5 so I could jump 1 to make 10. Then, I jumped 5 more and got 15. Mrs. Smith has 15 cookies.



4 + 5 + 6 = ☼

Student C:
I wrote: 4 + 5 + 6 = ☐. I know that 4 and 6 equals 10, so the oatmeal raisin and gingerbread equals 10 cookies. Then I added the 5 chocolate chip cookies. 10 and 5 is 15. So, Mrs. Smith has 15 cookies.

Student D:



I made 3 boxes to show I put together 4, 5, and 6. When I add them together I get 15. So, Mrs. Smith has 15 cookies.

1.ATO.3 Apply Commutative and Associative Properties of Addition to find the sum (through 20) of two or three addends.

First Grade students should use concrete, pictorial, and verbal representations (e.g., cubes, counters, number balance, number line, 100 chart, number bonds) to model the commutative property and associative property of addition when solving. Elementary students often believe there are hundreds of isolated addition and subtraction facts to be mastered. However, when students understand the commutative and associative properties, they are able to use relationships between and among numbers to solve problems. Students apply properties of operations as strategies to add and subtract. It is not important that students know the property name, but the concept the property provides. Students should begin to use symbols appropriately (i.e., + ,-,=) within the combinations of the three quantities.

Commutative Property of Addition	Associative Property of Addition
The order of the addends does not change the sum. For example, if 8 + 2 = 10 and 2 + 8 = 10, then 8 + 2 = 2 + 8. For example, if 2 + 3 + 8 = 13 and 3 + 8 + 2 = 13, then 2 + 3 + 8 = 3 + 8 + 2.	The grouping of the 3 addends does not affect the sum. For example, (2 + 6) + 4 = 8 + 4 = 12 and 2 + (6 + 4) = 2 + 10 = 12. Regardless of the grouping by parenthesis, the sum remains 12. Note: The order of the addends did not change – only the grouping.

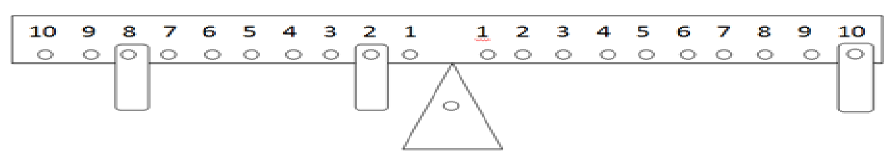
<u>Commutative Property Examples:</u>

<u>Cubes</u>

A student uses 2 colors of cubes to make as many different combinations of 8 as possible. When recording the combinations, the student records that 3 green cubes and 5 blue cubes equals 8 cubes in all. In addition, the student notices that 5 green cubes and 3 blue cubes also equals 8 cubes.

<u>Number Balance</u>

A student uses a number balance to investigate the commutative property. “If I put a weight on 8 first and then 2 which equals 10, then I think if I put a weight on 2 first this time and then on 8, it’ll also be 10.”



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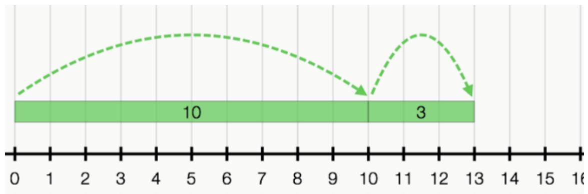
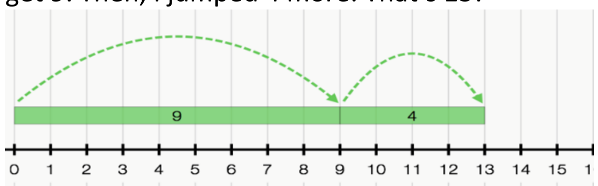
<u>Associative Property Example:</u>

<u>Number Line:</u> $\square$ = 4 + 6 + 3

Student A: First I started at 0 and jumped 10 because I knew when I add 4 and 6 I get 10. Then, I jumped 3 more, so I landed on 13.


Student B: I got 13, too, but I did it a different way. First I started at 0 and jumped to 9 because I knew when I add 6 and 3 I get 9. Then, I jumped 4 more. That’s 13!


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<td>1.ATO.4 Understand subtraction as an unknown-addend problem.</td>
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First Graders often find subtraction facts more difficult to learn than addition facts. This standard is laying the foundation for the inverse relationship between addition and subtraction, whereas, 1.ATO.8 is finding the missing number using any strategy. First Graders are able to use various strategies described below to solve subtraction problems.

<u>For Sums to 10</u>
<u>Think-Addition</u> uses known addition facts to solve for the unknown part or quantity within a problem. When students use this strategy, they think, “What goes with this part to make the total?” The think-addition strategy is particularly helpful for subtraction facts with sums of 10 or less and can be used for 64 of the 100 subtraction facts. Therefore, in order for think-addition to be an effective strategy, students must have mastered addition facts first.

For example, when working with the problem 9 - 5 = $\square$, First Graders think “Five and what makes nine?”, rather than relying on a counting approach in which the student counts 9, counts off 5, and then counts what’s left. When subtraction is presented in a way that encourages students to think using addition, they use known addition facts to solve a problem.

<u>Example:</u> 9 – 2 = $\square$
Student: I have 2, so how many more do I need to make 9? I am looking for a number added to 2 to equal 9. 2 plus a number equals 9. So, 2 + 7 = 9. My answer is 9 – 2 = 7.
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<u>For Sums Greater than 10</u>

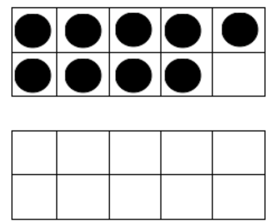
The 36 facts that have sums greater than 10 are often considered the most difficult for students to master. Many students will solve these particular facts with Think-Addition, while other students may use other strategies described below, depending on the fact. Regardless of the strategy used, all strategies focus on the relationship between addition and subtraction and often use 10 as a benchmark number.

<u>Build Up Through 10</u> is particularly helpful when one of the numbers to be subtracted is 8 or 9. Using 10 as a bridge, either 1 or 2 are added to make 10, and then the remaining amount is added for the final sum.

<u>Example:</u> **15 – 9 = □**

Student A: "I'll start with 9. I need one more to make 10 and then 5 more to make 15. That's 1 and 5- so it's 6. 15 – 9 = 6."

Student B: "I put 9 counters on the ten frame. Just looking at it I can tell that I need 1 more to get to 10. Then I need 5 more to get to 15. So, I need 6 counters."

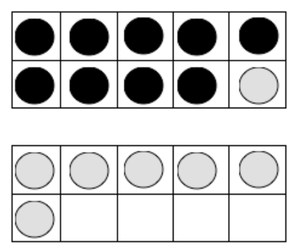


<u>Back Down Through 10</u> uses take-away and 10 as a bridge. Students take away an amount to make 10, and then take away the rest. It is helpful for facts where the ones digit of the two-digit number is close to the number being subtracted.

<u>Example:</u> **16 – 7 = □**

Student A: "I'll start with 16 and take off 6. That makes 10. I'll take one more off and that makes 9. 16 – 7 = 9."

Student B: "I used 16 counters to fill one ten frame completely and most of the other one. Then, I can take these 6 off from the 2nd ten frame. Then, I'll take one more from the first ten frame. That leaves 9 on the ten frame."



Van de Walle & Lovin, 2006

1.ATO.5 Recognize how counting relates to addition and subtraction.

When solving addition and subtraction problems to 20, First Graders often use counting strategies, such as counting all, counting on, and counting back, before fully developing the essential strategy of using 10 as a benchmark number.

Counting All: Students count all objects to determine the total amount.

Counting On & Counting Back: Students hold a “start number” in their head and count on/back from that number.

Example: **15 + 2 = □**

Counting All

The student counts out fifteen counters. The student adds two more counters. The student then counts all of the counters starting at 1 (1, 2, 3, 4,….,14, 15, 16, 17) to find the total amount.

Counting On

Holding 15 in her head, the student holds up one finger and says 16, then holds up another finger and says 17. The student knows that 15 + 2 is 17, since she counted on 2 using her fingers.

Example: **12 – 3 = □**

Counting All

The student counts out twelve counters. The student then removes 3 of them. To determine the final amount, the student counts each one (1, 2, 3, 4, 5, 6, 7, 8, 9) to find out the final amount.

Counting Back

Keeping 12 in his head, the student counts backwards, says “11” as he holds up one finger; says “10” as he holds up a second finger; says “9” as he holds up a third finger. Seeing that he has counted back 3 since he is holding up 3 fingers, the student states that 12 – 3 = 9.

1.ATO.6 Demonstrate : a. addition and subtraction through 20; b. fluency with addition and related subtraction facts through 10**.**	When students repeatedly use strategies that make sense to them, they internalize facts and develop fluency for addition and subtraction within 10. Students should use strategies such as counting on, making 10, decomposing a number leading to a 10, using the relationship between addition and subtraction, creating equivalent but easier or known sums, doubles plus or minus one, counting back, and the commutative property. Students need to also understand the role of 0 in addition and subtraction. Fluency is defined as efficient, accurate, and flexible. The phases of operational understanding are construct operational meaning, develop reasoning strategies, and work toward quick recall. Students need to attach meaning to the operations before there is any focus on fact fluency. The big ideas about numbers that help students make sense of math facts should be at the center of teaching math facts. The big ideas are: our number system is a system of patterns, the order of the addends does not change the sum (commutative property), addition and subtraction are inverse operations (e.g., Fact Families), and numbers are flexible; they can be broken apart (decomposed) to more easily perform an operation. *(*adapted from *Mastering the Basic Math Facts in Addition and Subtraction)* Developing Fluency for Addition & Subtraction within 10 Example: **Two frogs were sitting on a log. 6 more frogs hopped there. How many frogs are sitting on the log now?** **Counting- On**: I started with 6 frogs and then counted up, Six…. 7, 8. So there are 8 frogs on the log. 6 + 2 = 8 **Quick Recall Fact**: There are 8 frogs on the log. I know this because 6 and 2 more equals 8. 6 + 2 = 8 Add and Subtract within 20 Example: **Sam has 8 red marbles and 7 green marbles. How many marbles does Sam have in all?** **Making 10 and Decomposing a Number**: I know that 8 plus 2 is 10, so I broke up the 7 up into a 2 and a 5. First I added 8 and 2 to get 10, and then added the 5 to get 15. 7 = 2 + 5 8 + 2 = 10 10 + 5 = 15 **Creating an Easier Problem with Known Sums**: I broke up 8 into 7 and 1. I know that 7 and 7 is 14. I added 1 more to get 15. 8 = 7 + 1 7 + 7 = 14 14 + 1 = 15 Example: **There were 14 birds in the tree. 6 flew away. How many birds are in the tree now?** **Decomposing Leading to 10**: I know that 14 minus 4 is 10. So, I broke the 6 up into a 4 and a 2. 14 minus 4 is 10. Then I took away 2 more to get 8. 6 = 4 + 2 14 – 4 = 10 10 – 2 = 8 **Relationship between Addition & Subtraction**: I thought, ‘6 and what makes 14?’. I know that 6 plus 6 is 12 and two more is 14. That’s 8 altogether. So, that means that 14 minus 6 is 8. 6 + 8 = 14 14 – 6 = 8

Example: **Sam has 5 stickers. Joe gives him 5 more stickers. How many stickers does Sam have now?**

Doubles
I know that when I see two numbers that are the same, they represent doubles.
5 + 5 = 10

Example: **Five bunnies are sitting on the grass. Six more bunnies hopped over to them. How many bunnies are sitting on the grass now?**

Doubles Plus 1
5 + 6 = ?
I know that 6 is one away from 5. If I know my doubles fact 5+5=10, then I add 1 more to make 11.
5 + 5 = 10   10 + 1 = 11

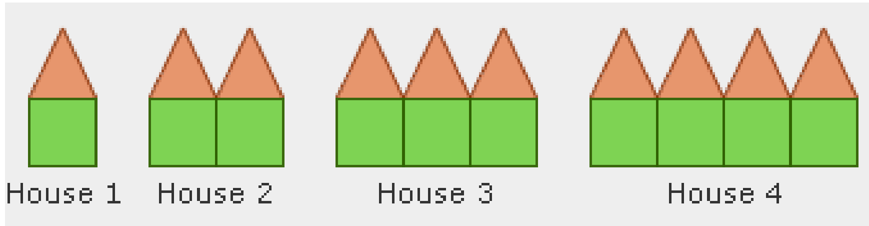
Example: **Carol has seven pieces of candy. Cathy has 3 pieces of candy. How many pieces of candy do they have in all?**

Commutative Property of Addition
If I know that 7 and 3 more is 10, then I know that 3 and 7 more is 10.
7 + 3 = 10 3 + 7 = 10

1.ATO.7 Understand the meaning of the equal sign, as a relationship between two quantities (sameness) and determine if equations involving addition and subtraction are true.	In order to determine whether an equation is true, First Grade students must first understand the meaning of the equal sign. This is developed as students in Kindergarten and First Grade solve numerous joining and separating situations with mathematical tools, rather than symbols. Once the concepts of joining, separating, and "the same amount/quantity as" are developed concretely, First Graders are ready to connect these experiences to the corresponding symbols (+, -, =). Thus, students learn the equal sign does not mean "the answer comes next", but the symbol signifies that in an equivalent relationship, the left side 'has the same value as' the right side of the equation. When students understand that an equation needs to "balance", with equal quantities on both sides of the equal sign, they understand various representations of equations, such as: • an operation on the left side of the equal sign and the answer on the right side (5 + 8 = 13) • an operation on the right side of the equal sign and the answer on the left side (13 = 5 + 8) • numbers on both sides of the equal sign (6 = 6) • operations on both sides of the equal sign (5 + 2 = 4 + 3). Once students understand the meaning of the equal sign, they are able to determine if an equation is true, such as 9 = 9, or not, such as 9 = 8.
1.ATO.8 Determine the missing number in addition and subtraction equations within 20.	First Graders use their understanding of and strategies related to addition and subtraction as described in 1.ATO.4 and 1.ATO.6 to solve equations with an unknown. Rather than symbols, the unknown symbols are boxes, question marks, or pictures. Students should use number sense as well as concrete and pictorial models such as number lines, while identifying the missing whole number. <u>Example:</u> **Five cookies were on the table. I ate some cookies. Then there were 3 cookies. How many cookies did I eat?** **Student A:** What goes with 3 to make 5? 3 and 2 is 5. So, 2 cookies were eaten. **Student B:** Five, four, three (*holding up 1 finger for each count back from five*). 2 cookies were eaten (*showing 2 fingers*). **Student C:** We ended with 3 cookies. Three, four, five (*holding up 1 finger for each count forward from three*). 2 cookies were eaten (*showing 2 fingers*). <u>Example:</u> **Determine the unknown number that makes the equation true. 5 - ☐ = 2** **Student:** 5 minus something is the same amount as 2. Hmmm. 2 and what makes 5? 3! So, 5 minus 3 equals 2. Now it's true!
1.ATO.9 Create, extend, and explain using pictures and words for:	Patterns can be found in physical and geometric situations as well as in numbers. <u>Repeating Patterns</u>: A cyclical repetition of an identifiable core. The core of the pattern is the string of elements that repeats. Students need to be able to recognize the core of the pattern. Ex. ABABAB - AB is the core. It is important to use knowledge of the core to extend the pattern.

a. repeating patterns (e.g., AB, AAB, ABB, ABC type patterns);
b. growing patterns (between 2 and 4 terms/figures)

Growing Patterns: A linear growing pattern that increases or decreases by a constant difference.

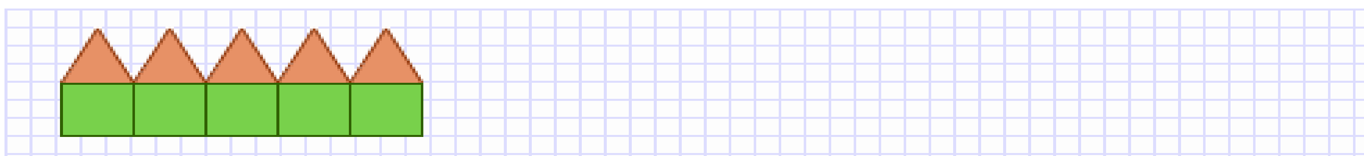


Teacher: What do you notice about these houses?
Emile: There are squares and triangles.
Martha: They get bigger each time.

Teacher: Describe what you mean by "bigger."
Martha: There are more squares and triangles with each house.
Fred: I see a pattern. Each time there is another house, there is one more square and one more triangle.

Teacher: What do you think the fifth house will look like?
Emile: I think it will be one bigger than House 4.

Teacher: Can you show me?
Emile uses pattern blocks to build the fifth house:



Teacher: Describe your house to me.
Emile: It has five squares and five triangles.

A great deal of reasoning is occurring in this activity. The students begin by describing the pattern and begin extending it with physical materials. They make conjectures about the pattern and predict the number of tiles and elements that come later.

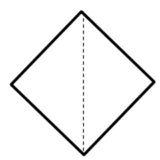
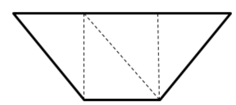
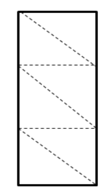
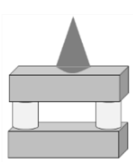
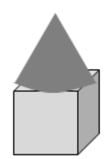
Geometry 1.G

Overview

Students compose and decompose plane or solid figures and build understanding of part-whole relationships as well as the properties of the original and composite shapes. As students combine shapes, they recognize the shapes from different perspectives and orientations, describe their attributes, and determine how they are alike and different while developing the background for measurement and for initial understandings of properties such as congruence and symmetry.

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision are: **shape, closed, open, side, corner, attribute, defining, non-defining, two-dimensional, circle, rhombus/rhombuses/rhombi, rectangle, square, trapezoid, triangle, hexagon, three-dimensional, cube, cone, rectangular prism, cylinder, sphere, partition, equal shares, halves, fourths, quarters.**

SCCCR	**Unpacking** What do these standards mean a child will know and be able to do?
1.G.1 Distinguish between a two-dimensional shape's defining (e.g., number of sides) and non-defining attributes (e.g., color).	Students use their beginning knowledge of defining and non-defining attributes of shapes to identify and name shapes (including circles, triangles, squares, rectangles, hexagons, rhombuses/rhombi, and trapezoids). They understand that defining attributes are always-present features that classify a particular object (e.g., number of sides, corners). They also understand that non-defining attributes are features that may be present, but do not identify what the shape is called (e.g., color, size, orientation, thickness). Two-Dimensional Defining Attributes for 1st grade • Closed figure • Straight sides • Number of sides • Number of corners • Relationship between length of sides (all equal sides; all unequal sides; some equal and some unequal sides) Circle Defining Attributes for 1st grade • No corner Example: **What are the defining and non-defining attributes of a triangle?** **Student:** All triangles must be closed figures and have 3 sides. These are defining attributes. Triangles can be different colors, sizes and be turned in different directions. These are non-defining attributes. Example: **Circle the triangle and explain your reasoning.** **Student:** I know that this shape is a triangle because it has 3 sides. It's also closed, not open. 

	<u>TEACHER NOTE:</u> In the U.S., the term “trapezoid” may have two different meanings. Research identifies these as inclusive and exclusive definitions. The inclusive definition states: A trapezoid is a quadrilateral with *at least* one pair of parallel sides. The exclusive definition states: **A trapezoid is a quadrilateral with *exactly* one pair of parallel sides**. With this definition, a parallelogram is not a trapezoid. South Carolina has adopted the exclusive definition.
1.G.2. Combine two-dimensional shapes (i.e., square, rectangle, triangle, hexagon, rhombus, trapezoid) or three-dimensional shapes (i.e., cube, rectangular prism, cone, and cylinder) in more than one way to form a composite shape.	As First Graders create composite shapes, a figure made up of two or more geometric shapes, they begin to see how shapes fit together to create different composite shapes. They also begin to notice shapes within an already existing shape by simply focusing on what shapes were combined and their attributes. They may use such tools as pattern blocks, tangrams, attribute blocks, or virtual shapes to compose different shapes. **Note:** A composite shape is a shape made up of several different shapes. Not all composite shapes will have a geometric name. <u>Example:</u> **What composite shapes can you create with triangles?** **Student A:** I made a rhombus. I used 2 triangles.  **Student B:** I made a boat. I used 4 triangles.  **Student C:** I made a tall skinny tower. I used 6 triangles.  <u>Example:</u> **What can you create with your 3-D shapes? What shapes did you use to build it? Why did you place the cone on the top of your structure? Why didn’t you place the cone at the bottom?**   As students combine shapes, they continue to develop their sophistication in describing geometric attributes and properties and determining how shapes are alike and different, thus building foundations for measurement and initial understandings of properties such as congruence and symmetry. Note: A rectangular prism is a solid with two identical rectangular bases.

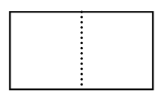
1.G.3 Partition two-dimensional shapes (i.e., square, rectangle, circle) into two or four equal parts.

First Graders begin to partition regions into equal shares using a context (e.g., cookies, pies, pizza, folded paper). This is the beginning development of the concept of fractions. So this standard deserves special attention since it is the first exposure to the future development of fractions. The emphasis is on the idea of equal shares/parts. This concept of equality can be linked back to the meaning of the equal sign introduced at standard 1.ATO.7. While the emphasis in First Grade is on the concept of equality, this lays an important foundation for the formal idea and symbolism of fractions introduced in grade 3. Attention should be given to building understanding with language, not with formal fraction notation.

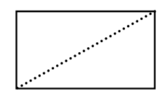
Working with “the whole”, students understand that “the whole” is composed of two or four equal parts. Students need many experiences with different sized circles and rectangles to recognize that when they cut something into two equal pieces, both pieces should be the same size if they are equal.

Example: **How can you and a friend share equally (partition) this piece of paper so that you both have the same amount of paper to paint a picture?**

Student 1
I would split the paper right down the middle. That gives us 2 halves. I have half of the paper and my friend has the other half of the paper.

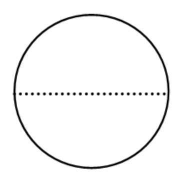


Student 2
I would split it from corner to corner (diagonally). She gets half of the paper and I get half of the paper. See, if we cut on the line, the parts are the same size.

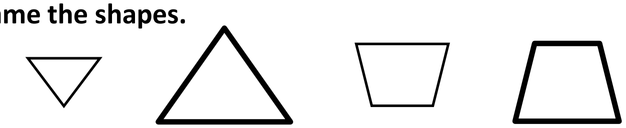


Example: **Let’s take a look at this pizza.**

Teacher: There is pizza for dinner. What do you notice about the slices on the pizza?



Student: There are two slices on the pizza. Each slice is the same size. Those are big slices!

1.G.4 Identify and name two-dimensional shapes (i.e., square, rectangle, triangle, hexagon, rhombus, trapezoid, circle).	First graders will correctly name shapes regardless of their orientations or overall size. The shapes and defining attributes are listed for teacher clarification. Rectangle: closed shape with 4 sides and 4 square corners Square: a rectangle that has 4 equal sides Triangle: closed shape with 3 sides and 3 corners Hexagon: closed shape with 6 sides and 6 corners Rhombus: closed shape with 4 sides of the same length Trapezoid: closed shape with 4 sides and *exactly* one pair of parallel sides Circle: closed shape with no corners **Note:** Parallel sides are sides that are opposite from each other and will not cross if the sides were extended. <u>Example:</u> **Name the shapes.** 

Measurement and Data Analysis 1.MDA

Overview

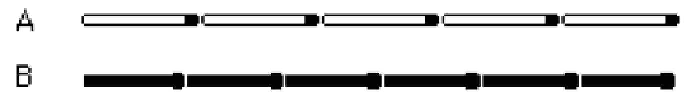
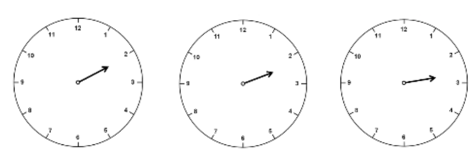
First graders develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating (the mental activity of building up the length of an object with equal-sized units) and the transitivity principle for indirect measurement (states if the length of object A is greater than the length of object B and the length of object B is greater than the length of object C, then the length of object A is greater than the length of object C)**.** First graders also learn to represent, interpret, and draw conclusions from data as well as identify coins.

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision are: **measure, order, length, height, more, less, longer than, shorter than, first, second, third, gap, overlap, about, a little less than, a little more than, time, hour, half-hour, about, o'clock, past, analog clock, digital clock, data, most, least, same, different, category, question, collect, penny, nickel, dime, quarter, cents, value.**

SCCCR Math Standard	Unpacking What do these standards mean a child will know and be able to do?
1.MDA.1 Order three objects by length using indirect comparison.	First Grade students will continue to build on their knowledge of using direct comparison to compare lengths while also adding indirect comparison to compare lengths as well. *Direct* comparison means that students compare the amount of an attribute in two objects without measurement. Example: **Who is taller?** **Student:** Let's stand back to back and compare our heights. Look! I'm taller! Example: **Find at least 3 objects in the classroom that are the same length as, longer than, and shorter than your forearm.** Sometimes, a third object can be used as an intermediary, allowing *indirect* comparison. For example, if we know that Aleisha is taller than Barbara and that Barbara is taller than Callie, then we know (due to the transitivity of "taller than') that Aleisha is taller than Callie, even if Aleisha and Callie never stand back to back. This concept is referred to as the transitivity principle for indirect measurement. The Transitivity Principle states if the length of object A is greater than the length of object B and the length of object B is greater than the length of object C, then the length of object A is greater than the length of object C. *Progressions for CCSSM: Geometric Measurement,* The CCSS Writing Team, June 2012 Example: **The snake handler is trying to put the snakes in order from shortest to longest. She knows that the red snake is longer than the green snake. She also knows that the green snake is longer than the blue snake. What order should she put the snakes?** **Student:** Ok. I know that the red snake is longer than the green snake and the blue snake because, since it's longer than the green, which means that it's also longer than the blue snake. So the longest snake is the red snake. I also know that the green snake and red snake are both longer than the blue snake. So, the blue snake is the shortest snake. That means that the green snake is the medium sized snake.

Snakes		
Shortest	⟵⟶	Longest
blue	green	red

	Example: **Which is longer: the height of the bookshelf or the height of a desk?** **Student A:** I used a pencil to measure the height of the bookshelf and it was 6 pencils long. I used the same pencil to measure the height of the desk and the desk was 4 pencils long. Therefore, the bookshelf is taller than the desk. **Student B:** I used a book to measure the bookshelf and it was 3 books long. I used the same book to measure the height of the desk and it was a little less than 2 books long. Therefore, the bookshelf is taller than the desk. Another important set of skills and understandings is ordering a set of objects by length. Such sequencing requires multiple comparisons (no more than 6 objects). Students need to understand that each object in a seriation is larger than those that come before it, and shorter than those that come after. Example: **The snake handler is trying to put the snakes in order- from shortest to longest. Here are the three snakes (3 strings of different length and color). What order should she put the snakes?** **Student:** I will lay the snakes next to each other. I need to make sure to be careful and line them up so they all start at the same place. So, the blue snake is the shortest. The green snake is the longest. And the red snake is medium-sized. So, I'll put them in order from shortest to longest: blue, red, green.
1.MDA.2 Use nonstandard physical models to show the length of an object as the number of same size units of length with no gaps or overlaps.	First Graders use objects to measure items to help students focus on the attribute being measured. Objects used lend themselves to future discussions regarding the need for a standard unit. Students will use the concept of iterating (the mental activity of building up the length of an object with equal-sized units) while measuring items. Teachers should ensure that students have units laid end-to-end with no gaps or overlaps and reach from one end of the object to be measured to the other end. First Grade students use multiple copies of one object to measure the length of a larger object. They learn to lay physical units such as centimeter or inch manipulatives end-to-end and count them to measure a length. Through numerous experiences and careful questioning by the teacher, students will recognize the importance of careful measuring so that there are not any gaps or overlaps in order to get an accurate measurement. This concept is a foundational building block for the concept of area in grade 3. **NOTE:** The instructional progression for teaching measurement begins by ensuring that students can perform direct comparisons. Then, children should engage in experiences that allow them to connect number to length, using manipulative units that have a standard unit of length, such as centimeter cubes. These can be labeled "length-units" with the students. Students learn to lay such physical units end-to-end and count them to measure a length. They compare the results of measuring to direct and indirect comparisons. *Progressions for CCSSM: Geometric Measurement,* The CCSS Writing Team, June 2012 Example: **How long is the pencil, using paper clips to measure?**  **Student:** I carefully placed paper clips end to end. The pencil is 5 paper clips long. I thought it would take about 6 paperclips.

	When students use different sized units to measure the same object, they learn that the sizes of the units must be considered, rather than relying solely on the amount of objects counted. <u>Example:</u> **Which row is longer?**  **Student Incorrect Response:** The row with 6 sticks is longer. Row B is longer. **Student Correct Response:** They are both the same length. See, they match up end to end. In addition, understanding that the results of measurement and direct comparison have the same results encourages children to use measurement strategies. <u>Example:</u> **Which string is longer? Justify your reasoning.** **Student:** I placed the two strings side by side. The red string is longer than the blue string. But, to make sure, I used color tiles to measure both strings. The red string measured 8 color tiles. The blue string measure 6 color tiles. So, I was right. The red string is longer.
1.MDA.3 Use analog and digital clocks to tell and record time to the hour and half hour.	For young children, reading a clock can be a difficult skill to learn. In particular, they must understand the differences between the two hands on the clock and the functions of these hands. In order to read an analog clock, they must be able to read a dial-type instrument. Furthermore, they must realize that the hour hand indicates broad, approximate time while the minute hand indicates the minutes in between each hour. By carefully watching and talking about a clock with only the hour hand, First Graders notice when the hour hand is directly pointing at a number, or when it is slightly ahead/behind a number. In addition, using language, such as “about 5 o’clock” and “a little bit past 6 o’clock”, and “almost 8 o’clock” helps children begin to read an hour clock with some accuracy. Through rich experiences, First Grade students read both analog (numbers and hands) and digital clocks, orally tell the time, and write the time to the hour and half-hour. Students should be using terms such as morning, night, today, tomorrow, yesterday, now, and later. Students also indicate if the time is in the morning (a.m.) or in the afternoon/evening (p.m.) as they record the time. Teachers should not expect students to draw clocks. Having first grade students draw a clock is developmentally inappropriate.  All of these clocks indicate the hour of “two”, although they look slightly different. This is an important idea for students as they learn to tell time.

1.MDA.4 Collect, organize, and represent data with up to 3 categories using object graphs, picture graphs, t-charts and tallies.	First Graders sort and organize objects into 2 or 3 categories using Object Graphs and Picture Graphs. Object Graphs (Real Graphs) are the most important of these graphing experiences because they lay the foundation of all graphing activities. In this kind of graph, children sort and compare groups of real objects such as chocolate chip and oatmeal cookies. Object graphs use the actual objects being graphed. Teachers can provide congruent cut out squares to students to help with lining up the objects. Then each item can be placed in a square so that comparisons and counts are easily made. Examples include types of shoes, seashells, and books. Picture Graphs use pictures or models to stand for the real things in the object graph. These graphs are more abstract because a picture, even if it is drawn by a child, only represents reality. An image of a cookie is not the cookie itself. These graphs are very important because they form the link between the concrete object and the abstract symbol. This prepares them for symbolic graphs and charts. Students can make their own drawings or you can duplicate drawings to be colored or cut out to suit particular needs. T-Charts and Tallies are used for students to collect, organize, and answer questions about data collected in surveys. First Graders need instruction on how to use tally marks correctly. The teacher will create graphs at the beginning of the year and move to group creation of graphs. By the end of the school year, students should be able to create graphs on their own. Teachers will provide the framework for data organization.
1.MDA.5 Draw conclusions from given object graphs, picture graphs, t-charts, tallies, and bar graphs.	First Graders draw conclusions from information in graphs and t-charts by answering questions such as: • How many are there in each category? Ex. How many children have shoes with laces? No laces? • Which category has more? Fewer? • How many more children like pepperoni pizza than cheese pizza? • How many fewer children like vanilla ice cream than chocolate? • Which categories have the same/equal number of students? Bar Graphs use shaded sections to stand for the real object or picture. This is the most abstract level of graphing because the bar or symbol (X) must be translated back into reality to have a meaning. An “X” or shaded box on a piece of graph paper can only stand abstractly for a real cookie. Students are not expected to create their own bar graphs. **Note:** When looking at separate categories on a bar graph, the bars do not touch.
1.MDA.6 Identify a penny, nickel, dime and quarter and write the coin values using a ¢ symbol.	First Graders should be able to identify pennies, nickels, dimes, and quarters. They should be able to distinguish the differences and write the values using a cent symbol. Students are not expected to find the value of a collection of coins. This is the first time money is introduced formally as a standard. Therefore, students will need numerous experiences with coin recognition and values of coins before using coins to solve problems. Once students have developed understanding of the value of each coin, then the coins could be used as a manipulative for students who are also working on counting by 1’s, 5’s, and 10’s and working with 1- and 2-digit numbers.

Common Addition and Subtraction Problem Types – Grade 1

	Result Unknown	Change Unknown	Start Unknown
Add to/ Joining	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? 2 + 3 = ?	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? 2 + ? = 5	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? ? + 3 = 5

Joining action-involves three quantities; an initial amount, a change amount (the part being added or joined), and the resulting amount (the amount after the action is over).

	Result Unknown	Change Unknown	Start Unknown
Take From/ Separating	Five apples were on the table. I ate two apples. How many apples are on the table now? 5 – 2 = ?	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? 5 - ? = 3	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? ? – 2 = 3

Separation action involves three quantities; the initial amount as the whole or the largest amount, a change, and result amounts.

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

Part-Part-Whole action-involves two parts that are combined into one whole. There is no meaningful distinction between the two parts within a part-part-whole situation, so there is no need to have a different problem for each part as the unknown.

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

Compare problems involve the comparison of two quantities, and the third amount is the difference between the two amounts. (Adapted from Van de Walle)