First Grade Mathematics

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

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

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

(3) Students will 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 to indirect measurement. (Note: Students should apply the principle of transitivity of measurement to make indirect comparisons, but they need not use this technical term.)

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

Strand: OPERATIONS AND ALGEBRAIC THINKING

Represent and solve problems involving addition and subtraction with 20.

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. *For example, use objects, drawings, and equations with a symbol for the unknown number to represent the problem.*
2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20. *For example, use objects, drawings, and equations with a symbol for the unknown number to represent the problem.*
3. Relate counting to addition and subtraction. *For example, by counting on 2 to add 2.*
4. Add and subtract within 20.
    a. Use strategies such as counting on; making ten (*for example, 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14)*; decomposing a number leading to a ten (*for example, 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9)*; using the relationship between addition and subtraction (*for example, knowing that 8 + 4 = 12, one knows 12 – 8 = 4)*; and creating equivalent but easier or known sums (*for example, adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13)*.
    b. By the end of Grade 1, demonstrate efficiency, accuracy, and flexibility for addition and subtraction within 10.

Understand and apply properties of operations and the relationship between addition and subtraction.

5. Apply properties of operations as strategies to add and subtract. *For example: 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.)* First grade students need not use formal terms for these properties.
6. Understand subtraction as an unknown-addend problem. *For example, subtract 10 – 8 by finding the number that makes 10 when added to 8.*

Work with addition and subtraction equations.

7. Understand the meaning of the equal sign, and determine whether 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.*
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 = ?*

Strand: NUMBER AND OPERATIONS IN BASE TEN

Extend the counting sequence.

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.

Understand place value.

2. Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:
   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).
3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

Use place value understanding and properties of operations to add and subtract.

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 to tens and ones to ones, and that it is sometimes necessary to compose a ten.
5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.
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.

Strand: MEASUREMENT AND DATA

Measure lengths indirectly and by iterating length units.

1. Order three objects by length; compare the lengths of two objects indirectly by using a third object.
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 the 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.*

Tell and write time.

3. Tell and write time in hours and half-hours using analog and digital clocks.

Represent and interpret data.

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 than in one category than in another.

5. Identify the values of pennies, nickels, dimes and quarters, and know their comparative values. (*For example, a dime is of greater value than a nickel.)* Use appropriate notation to designate a coin's value. *(For example, 5¢.)*

Strand: GEOMETRY

Reason with shapes and their attributes.

1. Distinguish between defining attributes (*for example, triangles are closed and three-sided*) versus non-defining attributes (*for example, color, orientation, overall size*); build and draw shapes that possess defining attributes.

2. Compose shapes.

   a. Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) to create a composite shape, and compose new shapes from the composite shape.

   b. Compose 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. First grade students do not need to learn formal names such as "right rectangular prism."

3. Partition circles and rectangles into two and four equal shares; describe the shares using the words halves, fourths, quarters; and use the phrases *half of, fourth of,* and *quarter of. D*escribe the whole as two or four of the shares. Understand that, for these examples, decomposing into more equal shares creates smaller shares.