

NVACS: Operations and Algebraic Thinking

In Kindergarten, students must:

- K.OA.1** - Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
- 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.
- 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 writing an equation (e.g., $5 = 2 + 3$ and $5 = 4 + 1$).
- 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.

As students move from counting everything to developing more sophisticated strategies to find out “how many,” students should engage in activities that help them understand the action of addition and subtraction.

Story problems

Students act out, retell, model using materials or drawing pictures to represent what is going on in the story.

For example: Call students up to the front of the room to act out different situations.

- 2 boys and 3 girls
- 4 people with long sleeved shirts and 1 with a short sleeved shirt
- 1 person facing forward and 4 people facing backward.

Ask the other students to show what is going on using manipulatives or by drawing pictures.

Arrangements

Students use a variety of objects to make arrangements and describe that arrangement by its parts. Students develop an understanding that numbers can be broken up in many different ways.

For example: Using color tiles, the student makes as many different arrangements of a given number as they can and describe the parts.



I see 4 and 2.

I see 2 and 2 and 2.



I see 3 and 3.

I see 2 and 2 and 2.



I see 1 and 5.

I see 2 and 2 and 2.

Combinations

Students use a variety of materials to find combinations of a number.

For example: Using two sided counters, students toss the counters and record how many landed on red and how many landed on yellow.



red	yellow
4	2
2	4

Using beans and a piece of string, students toss the beans and record how many landed above the string and how many landed below the string.



red	yellow
2	4
5	1

How Many Ways?

Students find several solutions when presented with a “How Many Ways” problem.

For example: I have a basket of 6 pieces of fruit. Some are apples and some are bananas. How many of each could there be.

Students problem solve to find multiple solutions.

apples	bananas
2	4
5	1

After the students work to find as many solutions as they can by themselves or with a partner, bring the class together and chart all the different ways the class found.

Ask the students if there is a way we could organize the ways so that we know we have all of the ways.

Missing Parts

Students begin to work with problems where one of the parts is missing but they know the whole. This can be through story problems or tasks.

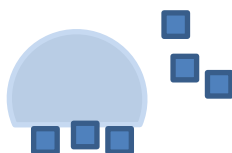
For example: Students act out, retell, model using materials or drawing pictures to represent what is going on in the story.

- Call 3 students up to the front of the room and say that you wish there were 5 students.
- Say 6 students went to the restroom. 4 were girls. How many were boys?

Students who are not acting out the problem should be modeling it with materials or drawings.

For example: Students complete tasks where they must tell the part that is missing.

Count out a given quantity of counters. Use a cup or a bowl to cover the counters. Reach under the bowl and take out some. How many are left under the bowl?

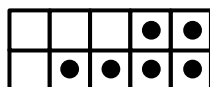


I started with 6. I pulled out 3. Now there are 3 under the bowl.

Parts of 10

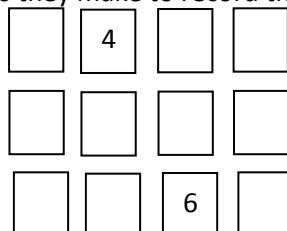
Students should be able to tell the parts of ten with any number from 1-9

For example: Students use Ten Frame Cards to “Complete a Ten.” Students draw a Ten Frame Card from a pile and tell how many are needed to complete the ten.



I drew a 6. I need 4 more to make a ten.

Students lay out numeral cards face down including the numbers 0-10. Student takes turns drawing two cards, trying to make matches with two cards that adds up to 10. Students keep the pairs they make to record their combinations later.



Symbols

Students should begin by describing what they see and the teacher writing it down. At first, use the language of the students, “3 and 3 is 6.” Later attach the symbols to their language and write, “ $3 + 3 = 6$.” Symbols will have meaning for the students only if they are used first to describe the mathematics.

After the teacher has modeled how to record equations, students can do so with guidance and then on their own. Tasks, like the ones, above give students many opportunities to write equations to represent the work they are doing.

Writing the same equations over and over again to describe different situations help the students understand that $4 + 3 = 7$, for example, is always true.