NVACS: Numbers and Operations in Base Ten

In First Grade, students must:

Extend the counting sequence.

1.NBT.1 -. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

Understand place value.

1.NBT.2 - Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:

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).

1.NBT.3 - Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

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

1.NBT.4 - Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-` digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

1.NBT.5 - Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

1.NBT.6 - Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

First Grade students know the rote counting sequence to 120 starting at any number less than 120. They use their 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) to develop accurate counting strategies.

Students are introduced to the idea that a group of ten ones is called "a ten" in first grade. This idea is known as unitizing. First Grade students have just learned to count ten objects, one by one. Now they are asked to unitize these ten objects as ONE group. They must be able to see the quantity as ten ones and one ten simultaneously to understand and use place value. For example, the student has 3 towers of ten cubes. Each tower has a value of 10 and would be counted as 30 rather than as 3. This is the foundation of the place value system and requires time and many experiences with concrete manipulatives to develop.

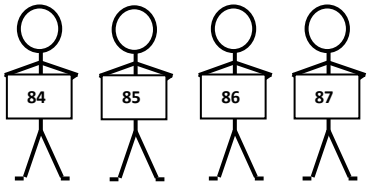
Conservation of number is critical for understanding place value. A student must believe that the quantity will not change no matter how it is grouped. They must know that 36 will still be 36 whether it is grouped as 3 tens and 6 ones,2 tens and 16 ones, 1 ten and 26 ones, or 36 ones. If they think that regrouping the objects will change the quantity then they cannot use place value to solve addition and subtractions problems with understanding.

Students in First Grade need to work with materials that can be grouped and ungrouped such as, connecting cubes, beans in cups, etc. Base ten blocks are not preferable in First Grade as it requires students to trade when do not fully understand that one stick of ten is the same as ten ones.
Straws can be used but once they are bundled, most students at this level lose the idea of ten. Once bundled, it becomes one group whereas a group of cubes in a ten stick still shows ten ones put together.

Counting sequence:

Students in First Grade build on the work that they did in kindergarten of counting to 100 and now count to 120. Tasks should help them develop an understanding of the relationships between the numbers.

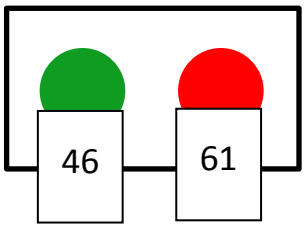
For example: First graders should work on ordering the larger numbers. One whole class experience is passing out numeral cards for a portion of the counting sequence. The students then have to put themselves in order.



For example: Students can play "Green Light, Red Light."

Students draw two numeral cards from a bag. They place the smaller quantity on the green light and the larger quantity on the red light.

The students then write the number sequence starting with the smaller number and stopping when they get to the larger number.



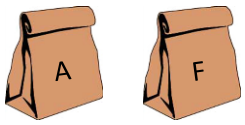
Name _____

46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

Conservation of large numbers:

Students in first grade should have conservation of numbers when the numbers are smaller. Now they need to develop that same understanding for larger numbers. The quantity of a set does not change no matter how it is grouped. They should have experiences grouping the same quantity in multiple ways.

For example: Students use "Inventory Bags." Put different amounts of objects into each bag. The student dumps them out, counts the objects by ones and records. The student then puts the same objects into groups of two, counts by two and records. He/she should continue grouping, counting and recording with 5s and 10s.



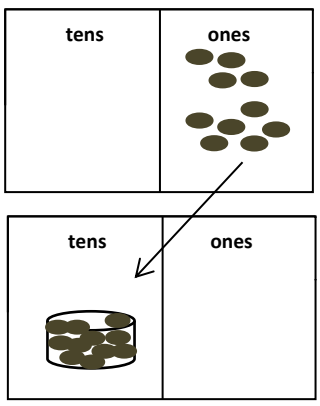
Name_____
Bag A
Counted by 1s 46
Counted by 2s 46
Counted by 5s 46
Counted by 10s 46

Students will begin to see that no matter how the objects are grouped, the quantity doesn't change unless you add more or take some away. This is a foundational concept for being able to use place value to add or subtract two-digit numbers with understanding.

Place Value: Students in Kindergarten worked with numbers from 11 – 19 to develop the understanding that the teen numbers include a group of ten and some leftovers. First graders continue to work on that understanding and extend it to multiple groups of tens and leftovers.

The students need many experiences with making groups and leftovers with materials that can be grouped and ungrouped.

For example: Students play the game, "Race to 100" where they roll a die, add that amount of counters to the ones place on their place value boards. When they have enough counters to make a ten, it should be grouped and moved to the tens place on the board.




Roll 1 4 add 4 beans


Roll 2 6 add 6 beans

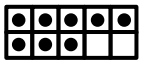
Students now have enough beans to make a group of ten and no leftovers. They are put into a portion cup and moved to the tens place.

Adding within 100, Two-digit + one-digit:

As students develop conservation of larger numbers and understand working with groups, they are ready for adding within 100.

Students should have worked with the ideas of making a ten and making a ten and leftovers with numbers from 11-19. These same ideas carry over to making "the next ten" and "the next ten and leftovers." Students should have concrete models at first, to visualize the mathematics.

Previously:



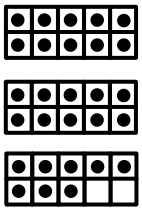
If I have 8, I need 2 more to make ten. 10 = 8 + 2

and

If have 8 and I want to add 5 more, I can use 2 from the 5 to make 10 and then add 3 more. 8 + 2 = 10
10 + 3 = 13

Now:

Ten Frames:



If I have 28, I need 2 more to make 30. 30 = 28 + 2

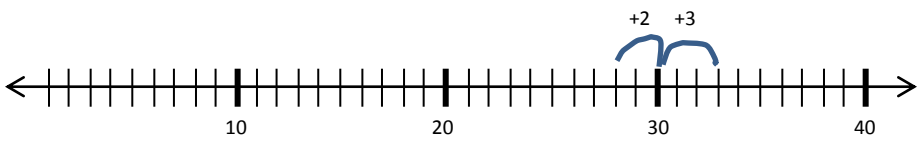
And if I have 28, and I want to add 5 more, I can use 2 from the 5 to make 30 and then add 3 more. 28 + 2 = 30
30 + 3 = 33

Cubes:

If I have 28, I need 2 more to make 30. 30 = 28 + 2

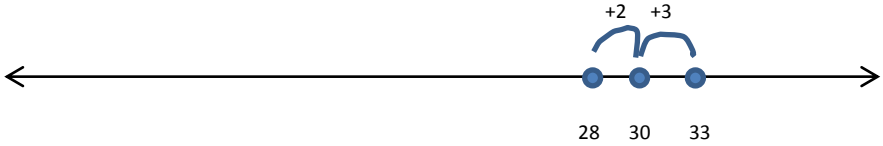
And if I have 28, and I want to add 5 more, I can use 2 from the 5 to make 30 and then add 3 more. 28 + 2 = 30
30 + 3 = 33

Number Lines (more abstract than the ten frame cards or cube towers):



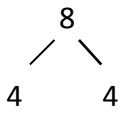
28 + 2 = 30
30 + 3 = 33

Open Number Line (more abstract)



After students have had time working with the models and describing the mathematics that they use to solve the problems, they should attach the symbols to their descriptions.

For example: Given the problem 36 + 8, if a student says I had 36 and I knew 4 more would make 40 so I broke the 8 into 4 and 4. I added one 4 to 36 to make 40 and then added 4 more.



36 + 4 = 40
40 + 4 = 44

When students have had practice with models and symbols together, they can think about the problems without the models.

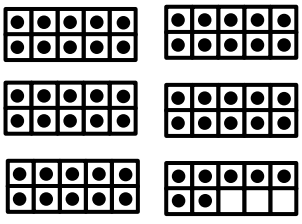
Word problems are a good place to start when taking the models away.

For example: Marcus had 36 baseball cards. His dad bought him 8 more. How many does he have now?

Adding within 100, Two-digit + ten or multiple of ten:

Students should also be working on adding tens or multiples of tens to any two digit number. Models should be used so students can visualize the idea that tens get added to tens before adding in symbols.

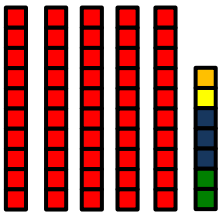
Ten Frames:



Ask the students how many dots.
Ask them how they knew.
Ask, "How many would there be if we added 10 more?" "20 more?"

This gives the students a good visual to see that ten or twenty more would get added to the tens place.

Cube Towers:



Ask the students how many cubes.
Ask them how they knew.
Ask, "How many would there be if we added 10 more?" "20 more?"

Again, this model gives the students a good visual to see that ten or twenty more would get added to the tens place.

Hundred Grid (more abstract than ten frames or cubes):

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

Marcus has 46 baseball cards. His dad gave him 30 more. How many does he have now?

46 + 10 = 56
56 + 10 = 66
66 + 10 = 76

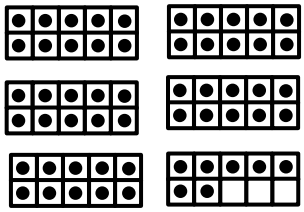
46 + 30 = 76

While this model is more abstract, some students get stuck counting on tens, rather than adding on tens. If students revert to counting on, use this model alongside the ten frame model or cube model and discuss how they are the same, different. While counting on tens is better than counting all tens, our ultimate goal is for students to know 40 and 30 is 70.

Subtracting within 100, Two-digit + ten or multiple of ten:

Students should also be working on subtracting tens or multiples of tens to any two-digit number. Models should be used so students can visualize the idea that tens get added to tens before using symbols.

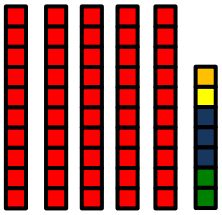
Ten Frames:



Ask the students how many dots.
Ask them how they knew.
Ask, "How many would there be if we took 10 away?" "took 20 away?"

This gives the students a good visual to see that ten or twenty would be subtracted from the tens place.

Cube Towers:



Ask the students how many cubes.
Ask them how they knew.
Ask, "How many would there be if we took 10 away?" "took 20 away?"

Again, this model gives the students a good visual to see that ten or twenty would be subtracted from the tens place.

Hundred Grid (more abstract than ten frames or cubes):

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

Marisel had 42 toy cars. She gave 20 to her friend. How many does she have now?

42 - 10 = 32
36 - 10 = 22

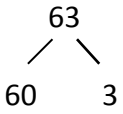
42 - 20 = 22

While this model is more abstract, some students get stuck counting back tens, or subtracting one ten at a time, rather than subtracting multiple tens. If students revert to counting back, use this model alongside the ten frame model or cube model and discuss how they are the same and different. While counting back tens is better than counting all tens, our ultimate goal is for students to know that 40 – 20 = 20.

Symbolic problems:

After students have had time working with the models and describing the mathematics that they use to solve addition and subtractions problems involving two-digit plus or minus a ten or multiple tens, they should attach the symbols to their descriptions.

For example: Given the problem 63 + 20, if a student says I had 63 and I broke it into 60 and 3. Then I added the 20 to the 60 and that was 80. Then I added the 3 and got 83.



60 + 20 = 80
80 + 3 = 83

When students have had practice with models and symbols together, they can think about the problems without the models.