Place Value for Numbers 1-20 in Kindergarten

Michelle Finegan

Introduction

Students in my self-contained special education kindergarten classroom begin the school year by learning to recognize, write, and count numbers. Students learn to count objects using 1 to 1 correspondence to answer the question "How many?" and learn to make groups of a given number with manipulatives to answer the phrase "Give me…". Students also learn numbers 1-20 so that they are able to recognize a given number, write it, and then are able to count it, either to check for accuracy when handed a group of objects, or to make their own group of objects. Next, students are expected to be able to make a teen number using ones and tens blocks, be able to write and read the number, and should be able to write a number sentence which breaks down tens and ones (such as 18=10+8).

Students in my self-contained special education classroom typically come to school with some of the basic prerequisite skills for kindergarten, such as knowing their numbers, letters, shapes, and colors as well as the ability to begin writing their first name with or without a model. Typical kindergarten students come in with various skills based on whether they attended preschool, daycare, or stayed at home before coming to kindergarten. However, it is my job to provide all students with the necessary tools and strategies to make the leap from pre-school prerequisite skills to kindergarten standards through the Common Core State Standards (see Appendix D).

Place value and determining what numbers look like in a visual format is crucial to student achievement in mathematics. My research is focused on teaching the set of whole numbers S={0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20} on teaching place value, and more specifically, teaching teen numbers 11-19 and writing corresponding number sentences in kindergarten.

Overview of School Characteristics

The Richardson Park Learning Center (RPLC) is a special school that serves students with disabilities. Every student at RPLC has a disability and is serviced using an Individualized Education Program (IEP), which includes areas of needs, benchmarks and goals, and services to support these goals, as well as a team of professionals who meet on a regular basis to determine changes in programming as needed. Typically, class sizes are approximately 6-12 students. Paraprofessionals support student learning in the classroom

and during other times such as lunch, recess, and specials. When the IEP team decides that a student has made adequate progress towards his/her IEP goals and areas of need, students are able to return to their neighborhood school to continue receiving special education services. Students who leave RPLC have usually made a significant amount of progress towards their goals and will be able to continue learning effectively in a more inclusive setting while still receiving services through their IEP.

This year, I am co-teaching in an inclusion classroom with a Richardson Park Elementary general education teacher. I have 4 special education RPLC students with disabilities such as Autism, Developmental Delay, and Other Health Impairment on my caseload. My co-worker has the remainder of the students on her roster, which includes 2 additional special education students for a total of 6 identified special education students in a class of 21 total. We are co-teaching and planning all lessons together to meet the needs of all students. Currently, 2 of my students are on-grade-level and 2 students are below grade level. My current difficulties with the inclusion model are making sure that all students receive differentiated instruction in small groups to meet the needs of below-level students and on-level students who require behavior support plans. In addition, my classroom is trialing a new math program called Math Expressions, which is produced by Houghton Mifflin Harcourt. This program is being trialed in four kindergarten classrooms in the Red Clay Consolidated School District.

Students at Richardson Park Learning Center (RPLC) identify themselves as: African American (25.1%), Asian American (4.3%), Hispanic (31.1%), White (35.8%), and Multi-Racial (3.7%). 67.2% identify as low-income. All students at RPLC are identified as special education students.

Students at Richardson Park Elementary School (RPES) identify themselves as: African American (31.7%), Asian American (1.0%), Hispanic (40.2%), White (25.3%), and Multi-Racial (1.7%). 69.9% identify as low-income, 10.8% identify as English Language Learner (ELL) and 10% identify as Special Education. In 2013-14, there were 88 kindergarten students and 482 students total at RPES.

How Place Value is Currently Taught in Kindergarten at RPLC

Place value is typically taught mid-year in kindergarten after students have learned how to count numbers 1-20. The Red Clay Consolidated School District has provided teachers with the Trailblazers materials as well as Engage NY materials online. However, beyond the core materials, much of my resources came from supplemental supplies found on websites such as Teachers Pay Teachers, SMART Exchange, and teacher-created lesson plans and games shared throughout the kindergarten team. Last year, I used many teacher-created ideas to help students learn place value through ones cubes and tens sticks. Multiple small group sessions were utilized to explain and teach what a tens stick

is and how to count it (saying ten, rather than counting each cube on the stick). Students then began practicing how to make the teen numbers and then writing the numbers. Because I had a wide-variety of abilities in my classroom, this task was very easy for some students, while others struggled to recognize numbers and/or count with one-to-one correspondence beyond 10.

This year, I am using the Math Expressions curriculum materials to teach place value. This program is geared towards on-level students and includes strategies and materials for below and above level students. However, the majority of the curriculum is taught in a whole group and assumes that students are learning at a regular pace. I created materials that teach place value through exploration as well as through games and modeling for all students to learn and grasp a deeper understanding of place value at their own pace.

Place Value Definition

Mathisfun.com defines place value as the value of where the digit is in the number, such as units, tens, hundreds, etc.

Van de Walle defines place-value concepts as:

> 1. Sets of ten (and tens of tens) can be perceived as single entities. These sets can then be counted and used as a means of describing quantities. For example, three sets of ten and two singles is a base-ten method of describing 32 single objects. This is the major principle of base-ten numeration.
> 2. The positions of digits in numbers determine what they represent—which size group they count. This is the major principle of place-value numeration.
> 3. There are patterns to the way that numbers are formed…
> 4. The groupings of ones, tens, and hundreds can be taken apart in different ways. For example, 256 can be 1 hundred, 14 tens, and 16 ones but also 250 and 6. Taking numbers apart and recombining them in flexible ways is a significant skill for computation.[1]

Common Core State Standards (CCSS)

Numbers and Operations in Base Ten - CCSS.MATH.CONTENT.K.NBT.A.1

Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (such as 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

Objectives

According the Common Core State Standards, students must be able to compose and decompose numbers 11-19 using a visual representation such as with manipulatives or by drawing a picture. Students are then expected to write a statement such as 10+8 to show their understanding of numbers greater than 10, which include a ten and some ones.

1. Students will be able to identify and name teen numbers when the number is shown with a visual representation such as in a picture format (manipulatives), numerals, or when ones cubes and tens sticks are shown.
2. Students will be able to create a teen number with ones cubes and ten sticks.
3. Students will be able to count from 1-20 with one-to-one correspondence with objects and rote counting out loud using traditional, explicit (10 and 8 is 18), and through describing place value (1 group of ten and 3 ones).
4. Students will be able to group objects into groups of 10 and count on to make teen numbers using manipulatives.

Essential Questions

1. What strategies can students use to count and name teen numbers (11-19)?
2. How can students use ones cubes and tens sticks, as well as other manipulatives, to make teen numbers?
3. How can students use manipulatives to write number statements to describe numbers 11-20 using ten plus some more?

Abstract Reasoning in Teaching Place Value

Even though kindergarten students play with manipulatives and perform concrete calculations, their play can be guided by the algebraic properties of the operation of addition of whole numbers, the properties of equivalence relations on a set of whole numbers, and the properties of the order relation on the whole number set.

Set of Numbers

The set of whole numbers is W={0, 1, 2, 3, …} and S={0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20} will be utilized in my unit on place value. Zero will be utilized because it is a place value holder for the numbers 10 and 20 when there are zero ones and because it represents the value of nothing. In addition, Natural/Counting numbers are denoted by N={1, 2, 3, …}, but the set {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20} are the numbers which are most-often utilized throughout my unit for making the teen numbers using 10+__ (1-digit numbers) to make the teen numbers (numbers 11-19).

Operations

Addition will be utilized in place value because we will be writing addition equations that demonstrate understanding of tens and ones (for example 10+3=13). Addition will be the focus operation of my unit.

Subtraction may also be utilized to show the breakdown because if a number is given, for example, 15, students would have to understand 15-10=5 (15 is a group of 10 and 5 ones). Subtraction in the Math Expressions curriculum is taught simultaneously with addition so that students make the connection between addition and subtraction. Though subtraction will be included in some place value lessons, I have chosen to focus primarily on addition as it relates to the relationship of teen numbers, which are comprised of a group of 10 plus some ones.

Algebraic Structure

The operation of addition gives algebraic structure to the set of whole numbers. The following properties of addition are essential to the instruction of place value.

1) Closure: For any 2 elements a and b in S, we have the result a+b in S.

The property of closure relates to place value because if you add any two elements in the set S, they will equal an element within the set S. For example, 10+4=14. All three numbers, 10, 4, and 14 are in S. This shows closure within S. However, for the statement 10+11=21, 21 is not in S defined above. In teaching this unit, I may create situations where both numbers are greater than 10, which would utilize more of W and would include 21, which is not in S but is in W. Therefore, S is not closed and W is closed with respect to addition.

2) Associativity: For any a, b, c in S, we have (a+b)+c = a+(b+c).

The property of associativity relates to place value because if you add three elements a, b, c from S, then you can add the first two of them (a +b) and their result is added to the third number c to get the same answer as if you add the first number a to the sum of the second and the third (b+c). For example, (2+8)+3=2+(8+3) and therefore 13=13. Teachers should be encouraged to teach their students to group numbers into 8+2=10 to make adding groups of 3 numbers easier for students. In addition, teachers should use word problems to make addition problems using three addends.

3) Identity Element: There exists an element e in S such that e+a = a+e = a for any a in S.

The identity element with respect to addition of whole numbers is 0.

The property of identity relates to place value because if you add zero to any number in set S, it will equal itself. For example 0+15=15+0.

4) Commutativity: For any elements a, b in S we have a+b = b+a.

The property of commutativity relates to place value because if you add a+b within a set, it is equal to b+a. For example, 3+5=5+3 (both equal 8). This shows that the property of commutativity holds for the addition of whole numbers from 0 to 20. Since addition of whole numbers is commutative, which means the order of the terms in a sum of whole numbers can be changed without changing the result, when teaching place value, students should recognize that 12 represents both 10+2 and 2+10 as well.

For commutativity and associativity, it should be noted that numbers should be chosen such that the sum does not exceed 20 in order to exhibit the properties within S. These properties would be exhibited in greater numbers for W. For example, the statement 12+13=13+12, the answer for both statements equals 25, but 25 is not in S. 25 is included in W. Teachers are encouraged to try numbers that give answers greater than 20 in order to show that the properties of commutativity and associativity continue to hold true.

Equivalence Relations And Order In The Set Of Whole Numbers

In order for students to reason abstractly, many strategies and activities can be utilized to elicit the algebraic structure properties, operations, and the set of numbers. For example, students can sort numbers into various groups by the following categories: numbers with the same ones digit, numbers with the same tens digit, numbers with one digit, numbers with two digits, or their own sort where they name the categories. Students can also work with numbers to put them into increasing and decreasing order, compare a number with another number (e.g., 2-digit vs. 2-digit numbers, 2-digit vs. 1-digit number) to answer the question of greater/fewer, more/less, bigger/smaller, compare a number with itself, and can build numbers and compare with a partner if their way of building a number is the same/different (e.g. red and blue tiles to make a given number using a different number of red and blue tiles or using a different arrangement). When students have a conceptual understanding of the numbers 1 to 20 (able to count to 20, count with one-to-one correspondence, compare two numbers, and put numbers in increasing/decreasing order), the next step is to introduce place value by explaining ones versus tens and having students sort the numbers by the ones place and the tens place to complete the activities stated above such as by building numbers using both counters and place value blocks, comparing numbers, and defining two numbers using more/less, bigger/smaller, and greater/fewer.

Content

Numbers 1-10

Students in kindergarten learn their numbers 1-10 by activities such as counting out loud, on their fingers, and by using songs and games. Students then place numbers in order, make numbers 1-10 using manipulatives by using multiple colors/kinds of counters, placing counters in different arrangements (in a line, in a circle, groups of 5) and describing the different arrangements using describing words and comparing words such as: more/less, greater/fewer, bigger/smaller. Students are then expected to identify (receptively and expressively) and write numbers using the correct formation or approximations as appropriate for students with disabilities. Finally, students should be able to put numbers in order, find the missing number, think of a number that is more/less, greater/fewer, bigger/smaller, identify sets of numbers, and identify numbers with other representations such as with dots, counters, or other objects and tell the number using numerals, verbally, or by writing the number.

When students are able to do the majority of the skills above, teachers should introduce grouping objects by a 5-group and then counting on so that, for example, number 8 is represented by a 5-group and 3 more (5, 6, 7, 8). When students are able to represent the 5-group, the idea of the tens frame should be introduced so that students are able to see and identify numbers based on using the tens frame.

Numbers 11-20

Once students are able to complete the activities above for numbers 1-10, the same sequence of activities should be repeated for numbers 11-20. In addition, the use of the 5-group language, 10-Counter Strip, and then the tens frame should be regularly integrated into classroom activities for easier identification of numbers 1-20.

Addition

Addition should be introduced beginning in kindergarten at the start of the school year. Even if students are not writing formal number sentences, it is important to identify that addition means putting two groups together to count the total number of objects. In the Math Expressions program, Karen Fuson introduces addition in lesson 7 of unit 1. Students verbally practice adding using picture scenes and visually practice adding while using their counting mats. Students are expected add and subtract using formal equations by lesson 4 of unit 3. Within place value of numbers 11-20, students will write number sentences to help them describe the ones and tens such as 14= 10+4.

Research

After researching place value and various studies involving young learners, there are a few points that have been repeatedly displayed. First, the names of the teen numbers do not correspond with their values. For example, thirteen does not elicit students to think

ten and three especially based on the prefix "thir." The numbers eleven and twelve do not even remotely correlate with ten and one (11) and ten and two (12). In other countries such as China, the names are represented as "ten and one" which allow children to automatically think in terms of place value. Overall, the results of the study indicate that students who were taught the "explicit number names" (ten and one, ten and two, etc.) read 70% of the numerals correctly compared to 40% of the numerals read for those taught using traditional number names.[2]

Second, student representations of numbers vary based on how they learn to model the teen numbers. A canonical representation is one in which "a two-digit number using the correct number of ten-bundles and single straws" is used (Browning, 87). Overall, students who used explicit number names modeled 44% of numbers correctly compared to 10% for traditional number names.[3]

Third, student knowledge of place value (identifying individual digits in a two-digit numeral after reading the number) varied significantly based on how students learned numbers. Students who were in the explicit number names group were able to identify by pointing to the tens and ones place was 53% compared to the traditional numbers group which was 28%.[4]

Fourth, number names beyond ten are confusing for students because they do not explain place value. Even though the numbers 20, 30, 40, etc. include parts of the number they are representing, they do not include the word "tens" and therefore make it difficult for students to think of the tens place when stated. Children should say the traditional names along with the explicit name, for example, 20 is 2 tens, 30 is 3 tens, 40 is 4 tens, etc. in order to identify place value. It is also noted that children should be taught to think of the number in the tens place as the number of tens and the number in the ones place as the number of ones.[5]

Finally, research has indicated that there are some strategies and manipulatives that can be utilized to solidify understanding of place value. First, using a hundreds chart will help students to identify numbers visually with numbers in columns rather than across a row to show place value. Second, manipulatives such as tens sticks and ones cubes can be utilized to make two-digit numbers. Third, students should be required to compare two-digit numbers by making the numbers using the tens sticks and ones cubes and lining up the cubes to be able to compare effectively. All of these strategies will help students to further their understanding of place value especially with numbers 11-20.[6]

Teaching Strategies

Cooperative learning: Students will work in various groupings (homogenous and heterogeneous) to engage in Math Talk about the skills practiced in whole group lessons.

Centers: Through the use of hands-on activities, students will discover and apply skills taught in class in small groups. Centers will be differentiated to meet the needs of students' levels.

Small group instruction: Students who are still learning numbers and counting will meet in small group in order to help them practice skills they will need to learn place value.

Modeling/Scaffolding: Both modeling and scaffolding will occur to show students how to complete various tasks. As students become more familiar, the teacher will utilize scaffolding techniques so that students spend more time discovering and utilizing Math Talk with peers.

Math Language: While researching and through my Delaware Teacher Institute seminars, I have discovered that some of the math phrases I have been using are creating confusion among students as they get into older grades. Here are a few that I have learned and will now use.

Equality used to be defined as "same as" especially when referring to the equals sign. However, another way of referring to equality and the equals sign is defining the equals sign as "same value as" because though 2+4 yields the same value as 4+2, they are not the same equations.

Second, there needs to be a distinction between digits and numerals, as well as numbers. For example, the digits 3 and 6 are in the numeral 36. 36 is made up of the numbers 30 and 6.

Third, stating "addition makes things larger" can be stated as "combining two or more parts together to get a total." In the future, addition of negative numbers may not always result in a bigger number, so we need to be careful in our wording in the early elementary grades.[7]

Math Talk: Children should be encouraged to use math language with a partner or group of 3 students to discuss their reasoning. Math Expressions uses Math Talk in many of their lessons to get students to explain their reasoning to one another. Teachers should begin this strategy by modeling it and then having students model in front of the class before allowing students to try it on their own.

Classroom Activities

The activities below are in addition to the use of the Math Expressions program, or, where appropriate, a substitute for similar concepts and activities. Please refer to the

Math Expressions program for further information on math background, worksheets to reinforce skills, and additional activities to utilize.

Activity 1: Groups of 10

Objective:

Students will be able to count and identify groups of 10 objects.

Materials:

Various manipulatives for pairs to group; Number 10 Mat (1 and 0 in bubble letters); 10-Counter Strip (straight line with counters placed in two groups of 5)

Procedure:

Students practice counting out loud 1-10 in whole group. Then, the teacher will model learning center activities where students work in partners to put objects into groups of 10. Students rotate through centers with different objects and place the group of 10 in the "Number 10 Mat" in the number 1 and/or in the 10-Counter Strip. See Math Expressions Unit 3, Lesson 2 and Student Activity Book 1 page 93.

Activity 2: Counting 1-20 Using Traditional and Explicit Number Names

Objective:

Students will be able to count out loud using explicit numbers and traditional numbers as well as through showing their fingers while counting. Students will say, "ten and one, eleven; ten and two, twelve; ten and three, thirteen; ten and four, fourteen; ten and five, fifteen; ten and six, sixteen; ten and seven, seventeen; ten and eight, eighteen; ten and nine, nineteen; ten and ten, twenty."

Materials:

Visual for Numbers 1-20 including large number cards (1-10), numbers 1-20 in order (Number Patterns Poster), small number cards 1-10 (Student Activity Book page 103); 3 dice per group/pair (1^{st} die with 0, 1, 2, 0, 1, 2; 2^{nd} die with 1, 2, 3, 4, 5, 6; 3^{rd} die with 1, 2, 3, 7, 8, 9); Tens and Ones Place Math Mat (See Appendix A)

Procedure:

Teacher will ask students to count from 1 to 20 using traditional numbers. Teacher will then discuss that "teen" means "ten." Teacher will point out that some teen numbers are

confusing because they do not say “teen” at the end (11 and 12) and some teen numbers do not use the number of ones in their name (11, 12, 13, and 15). Teacher will then discuss how to use explicit names to describe numbers (10 and 2 12; 10 and 8 is 18). Teacher will lead counting using new explicit number names with traditional names (ten and one, eleven; ten and two, twelve; ten and three, thirteen; ten and four, fourteen; ten and five, fifteen; ten and six, sixteen; ten and seven, seventeen; ten and eight, eighteen; ten and nine, nineteen; ten and ten, twenty”). Teacher will model activity where students roll two dice and make a number by putting one die in the tens place on the Tens and Ones Place Math Mat and one die in the ones place on the Tens and Ones Place Math Mat (Appendix A). Students will then break into pairs or groups of three students to practice naming numbers by rolling two dice (see above materials) and reading the number name out loud using the explicit and traditional names. Students roll first die and one other die to create and read a number. Students can read the number using traditional numbers, explicit numbers, or numbers that explain place value (example: one group of ten and four ones for 14). For differentiation with advanced learners, the first die can include 0, 1, 2, 3, 4, and 5, which would create numbers through 59.

Activity 3: Groups of 10 Objects Plus Some More

Objectives:

Students will be able to see sets of objects as ten objects and some more and will be able to count the objects and name them using explicit and traditional number names and match number cards. Students will be able to match tens frames with number cards.

Materials:

Various manipulatives for each group; number cards 1-10 for each small group/pair to make the numbers by putting the ones number over the zero on the 10 card to make teen numbers (purple number tiles); Tens frames for numbers 1-20 (See Teacher Resource 5); Student Activity Book page 133 – Number Cards and Addition Statements

Procedure:

Teacher will model the first game where students are counting groups of objects and making the corresponding teen number using the number ten and putting the number of ones over the number zero. Teacher will model the second game where students see a tens frame and match it to the corresponding number (use Student Activity Book page 133 – Number Cards 11-19 and Number Statements; purple number tiles 1-10). Teacher will model the third game where students choose a specific number (11-19) and then make that number using manipulatives. Teacher will model the fourth activity where students use the number cards 11-19 and Number Statements (Math Expressions Student Activity Book page 133) to play a memory game where students match the number

statement and the number until all pairs are matched. For all four activities, students will also express how many objects and/or the number name using the explicit and traditional names, as well as using place value to describe the number (one group of ten and three ones for number 13). For the four activities, students will work in pairs or groups of 3 students to practice identifying groups of objects and counting, practice matching tens frames to corresponding numbers, and practice making numbers while also stating the traditional, explicit, and place value names.

Activity 4: Making Teen Numbers

Objective:

Students will be able to create teen numbers using ones and tens blocks and other manipulatives.

Materials:

Ones and tens blocks, 1-20 Board (Math Expressions Unit 4 Lesson 3) on the side with numbers 11-20, number cards/number dice with numbers 11-20 (one set of each per pair or group of 3 students), Teen Equation Cards (Math Expressions Student Activity Book page 159)

Procedure:

Teacher will model activity where students will practice making teen numbers through using number cards/rolling number dice using various manipulatives. Students will then practice in pairs or groups of 3 students and will take turns reading the number using the explicit and traditional numbers, as well as through describing the number using place value and then making the number using manipulatives. Students can also complete this activity using the 1-20 Board (on the side with 11-20) and ones and tens cubes to create numbers 11-20. For differentiation with advanced learners, teacher can use the teen equation cards (example: 11= 10+1) to match on the 1-20 Board on the side with 11-20 (Math Expressions Students Activity Book page 159)

Activity 5: Using Addition to Make Teen Numbers

Objective:

Students will be able to write statements to describe teen numbers as 10 + ___ (a number) = ____ or _____= 10+ (a number).

Materials:

"This is How I See the Number..." Math Mat, number cards, tens frames, Function Machine Math Chart, box with sides cut off, 1-20 Board on the side with 11-20, Teen Equation Cards (Math Expressions Student Activity Book page 159), ones and tens cubes

Procedure:

Teacher will model "This is How I See the Number..." activity where students will create number bonds with the teen number in a box and then two boxes diagonally to show the breakdown of 10 and some more. Students will then complete this activity given number cards and tens frames in small groups. Teacher will then explain the Function Machine, which always changes the number by the same amount (for this example, the change will always be +10). Teacher will show chart and explain (using a visual such as a box with both sides cut open) how a number can be changed when it goes through the Function Machine. This concept will be the foundation for making number statements. After the Function Machine is demonstrated and students practice it in partners or groups of 3 students, they will practice the concept of addition through the use of the 1-20 Board on the side with 11-20 to match the Teen Equation Cards (Math Expressions Student Activity Book page 159) to the corresponding teen numbers. Students can also make the numbers using ones and tens cubes.

Information About Activities 1-5

Teachers should note that the Math Expressions curriculum was utilized in initially developing the sequence of lessons as well as the activities. However, if there is not access to the materials noted, similar materials can be created to complete the activities and games explained above. In addition, this unit combines activities that are spread out in multiple units in the Math Expressions curriculum into one concise order of activities so that place value can be taught all at one time. Teachers may choose to complete activities over a period of time or may complete them consecutively.

Appendices B and C can be utilized after any of the lessons but will work best with activities 4 or 5. These worksheets can provide useful assessment data to determine which students understand the concept of place value and creating number statements and which students may require additional re-teaching and practice.

Teacher resources 1-3 below can be additional math center activities, videos and games utilized during instruction, or for students who finish early or are struggling learners.

Finally, I used the Math Expressions program, which includes a Student Activity Book, Teachers' Manuals, and manipulatives and mats that are part of the curriculum. There are additional resources that go along with the curriculum such as the Response to

Intervention Tier 1 Lessons and Tier 2 and 3 Lessons, Homework and Remembering Book, and Assessment Guide.

Teacher Resources

1) Starfall.com (Games: Base Ten Number and Operations - Base Ten Practice; Compose Decompose; Place Value)
(http://more2.starfall.com/m/welcome/first-demo/load.htm?www=first_grade)

2) Dream Box Resources for Kindergarten Teachers (Games)
(http://www.dreambox.com/teachertools)

3) Brainpopjr.com (Videos: Number Sense – Place Value; Addition and Subtraction – Making Ten)
(www.brainpopjr.com)

4) Math Expressions Program (Houghton Mifflin Harcourt)
(http://www-k6.thinkcentral.com/ePCLandingPage/#math)

5) Teachers Pay Teachers
http://www.teacherspayteachers.com/Product/Place-Value-Practice-Numbers-11-to-29-Freebie-1118516

Bibliography

Browning, Sandra T., and Judith E. Beauford. "LANGUAGE AND NUMBER VALUES: THE INFLUENCE OF NUMBER NAMES ON CHILDREN'S UNDERSTANDING OF PLACE VALUES." *Investigations in Mathematics Learning* 4, no. 2 (2011): 1-24. http://web.b.ebscohost.com.udel.idm.oclc.org/ehost/pdfviewer/pdfviewer?sid=124a568f-c118-4c4e-afc3-64ef6ab4f69e%40sessionmgr114&vid=4&hid=124 (accessed July 22, 2014).
This resource was used while I was researching and guided my activities.

Cooper, Linda L., and Ming C. Tomayko. "Understanding Place Value." *Teaching Children Mathematics* 17, no. 9 (2011): 558-567.
This article describes the different base systems used in ancient number systems.
Hopkins, Theresa M., and Jo Ann Cady. "WHAT IS THE VALUE OF @*#? Deepening Teachers' Understanding of Place Value." *Teaching Children Mathematics* 13, no. 8 (2007): 434-437.
This is a brief article that examines the base-ten system and includes information from pre-service and in-service teachers.

Faulkner, Valerie N. "Why the Common Core Changes Math Instruction." *Phi Delta Kappan* 95, no. 2 (2013): 59-63. Accessed October 29, 2014. http://pdk.sagepub.com/content/95/2/59.full.pdf html.
This article is a great resource the discusses common statements used by teachers and how we can learn new phrases to make sure that students feel less confused as they complete more difficult math tasks in the future. It focuses on Common Core language.

Howe, Roger, and Susanna S. Epp. "Taking Place Value Seriously: Arithmetic, Estimation, and Algebra." Mathematical Association of America. http://www.maa.org/sites/default/files/pdf/pmet/resources/PVHoweEpp-Nov2008.pdf (accessed August 12, 2014).
This article was used while researching place value for young students.

Howe, Roger. "The greatest calamity in the history of science." Mathematics under the Microscope. http://micromath.wordpress.com/2011/07/13/the-greatest-calamity-in-the-history-of-science/ (accessed August 13, 2014).
This article discusses that there is less emphasis on elementary mathematics and how we can improve on mathematics and place value for young learners.

Howe, Roger. "Three Pillars of First Grade Mathematics, and Beyond." In *Mathematics Curriculum in School Education (Advances in Mathematics Education)*. Eighth ed. New York London: Springer Science+Business Media Dordrecht, 2014. 183-207.

This article included great information on place value and how students learn place value starting with learning teen numbers all the way up to addition and subtraction.

Howe, Roger, and Harold B. Reiter. "The Five Stages of Place Value." Teachers of India. http://www.teachersofindia.org/en/article/five-stages-place-value (accessed August 13, 2014).
This short article discusses the various steps of learning place value.

McGuire, Patrick. "Analysis of Place Value Instruction and Development in Pre-Kindergarten Mathematics." *Early Childhood Education Journal* 41, no. 5 (2013): 355 - 364. http://web.b.ebscohost.com.udel.idm.oclc.org/ehost/detail?vid=3&sid=124a568f-c118-4c4e-afc3-64ef6ab4f69e%40sessionmgr114&hid=124&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#db=eft&AN=89455843 (accessed July 22, 2014).
This article was read during the research portion of my project.

Ronshausen, Nina L. "Introducing Place Value." *The Arithmetic Teacher* 25, no. 4 (1978): 38-41. http://www.jstor.org.udel.idm.oclc.org/stable/10.2307/41190370?Search=yes&resultItemClick=true&searchText=place&searchText=value&searchText=+&searchText=elementary&searchUri=%2Faction%2FdoBasicSearch%3FQuery%3Dplace%2Bvalue%2B%252B%2Belementary%26amp%3Bac (accessed July 21, 2014).
This article discusses activities that can be utilized when teaching place value.

Van de Walle, John A. *Elementary and middle school mathematics: teaching developmentally*. 5th ed. Boston: Allyn and Bacon, 2004.
This textbook was used to review definitions and recall research regarding place value.
Math is Fun. "Place Value." Definition of Place Value. http://www.mathsisfun.com/definitions/place-value.html (accessed August 15, 2014).
This website helped me to determine a solid definition for place value.

Notes

[1] Van de Walle, John A. *Elementary and middle school mathematics: teaching developmentally*. 5th ed. Boston: Allyn and Bacon, 2004.

[2] Browning, Sandra T., and Judith E. Beauford. "LANGUAGE AND NUMBER VALUES: THE INFLUENCE OF NUMBER NAMES ON CHILDREN'S UNDERSTANDING OF PLACE VALUES." *Investigations in Mathematics Learning* 4, no. 2 (2011): 1-24. http://web.b.ebscohost.com.udel.idm.oclc.org/ehost/pdfviewer/pdfviewer?sid=124a568fc118-4c4e-afc3-64ef6ab4f69e%40sessionmgr114&vid=4&hid=124 (accessed July 22, 2014).

[3] Ibid.

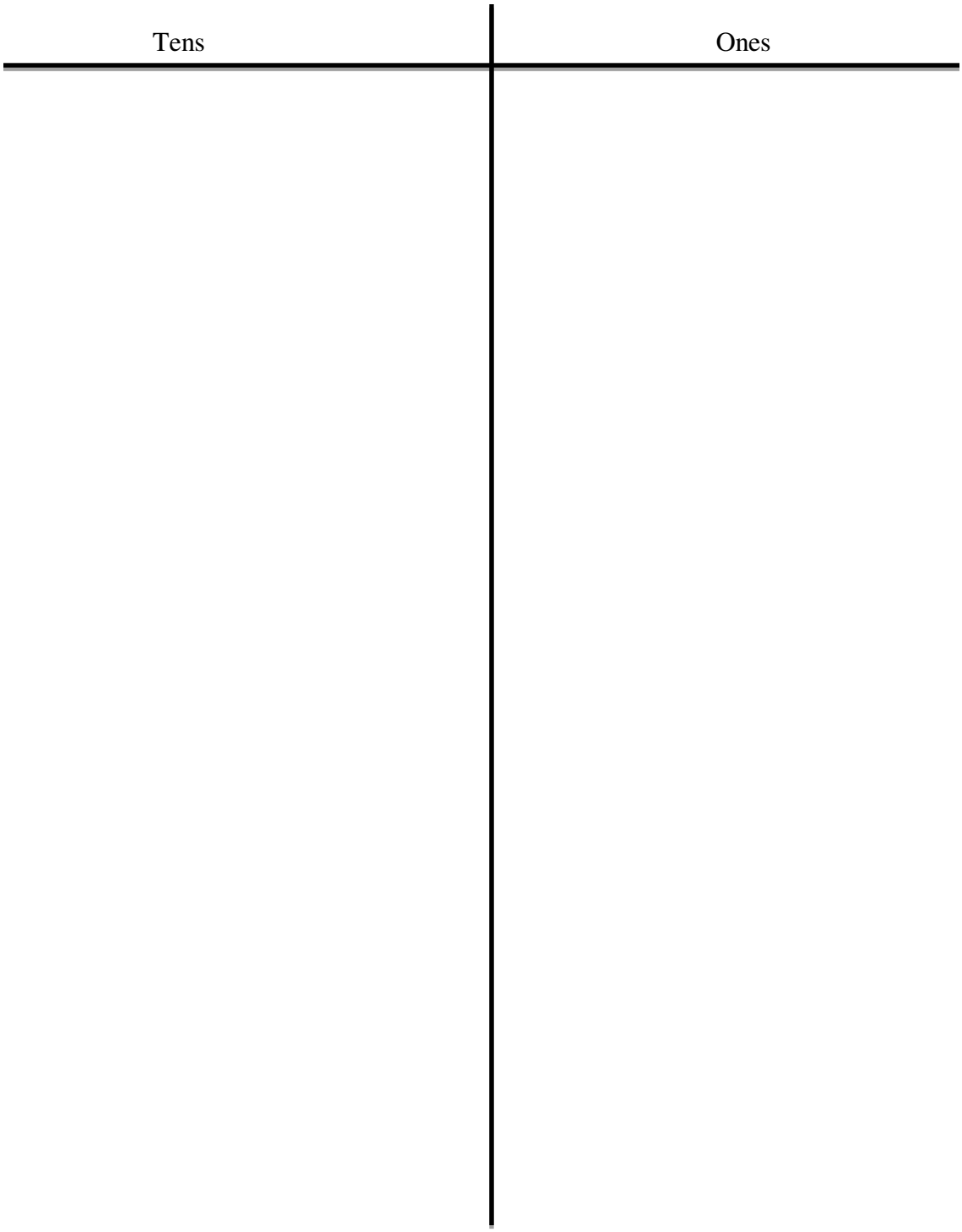
[4] Ibid.

[5] Howe, Roger. "Three Pillars of First Grade Mathematics, and Beyond." In *Mathematics Curriculum in School Education (Advances in Mathematics Education)*. Eighth ed. New York London: Springer Science+Business Media Dordrecht, 2014. 183-207.

[6] Ibid.

[7] Faulkner, Valerie N. "Why the Common Core Changes Math Instruction." *Phi Delta Kappan* 95, no. 2 (2013): 59-63. Accessed October 29, 2014. http://pdk.sagepub.com/content/95/2/59.full.pdf html.

Appendix A

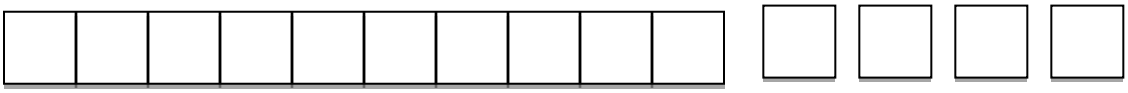


Appendix B

Name _____ Date _____

Directions: Draw a picture and write an addition number statement using a 10-group that describes the number above.

14

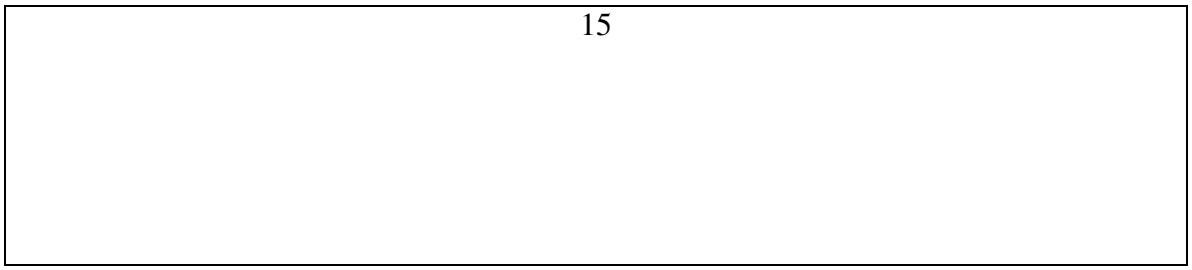


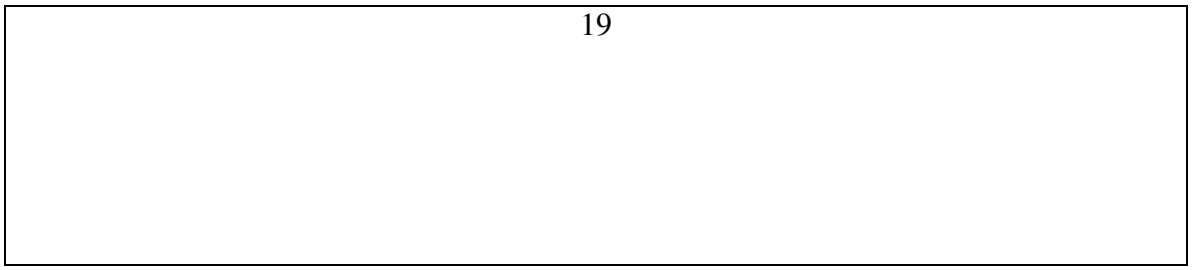
10 + 4 = 14

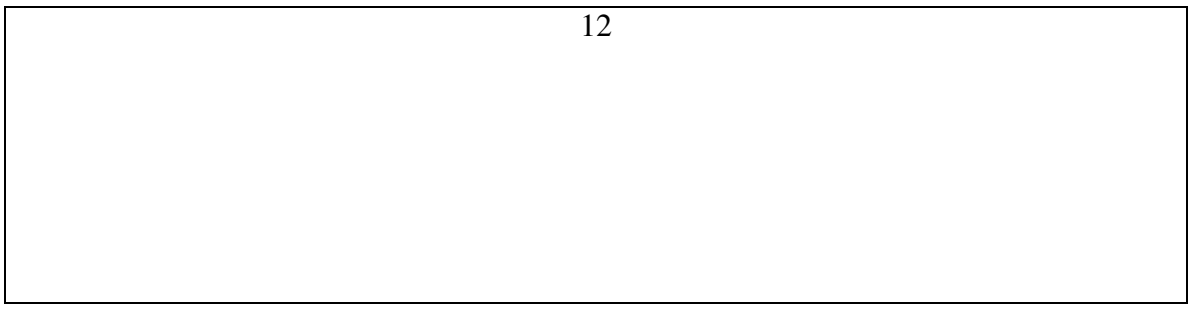
18

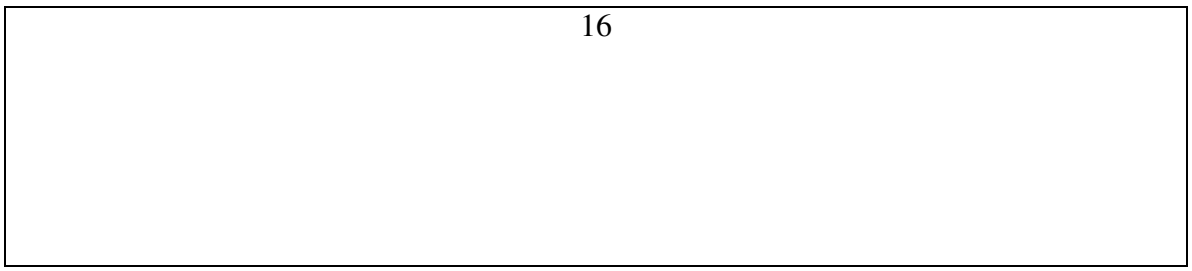
13

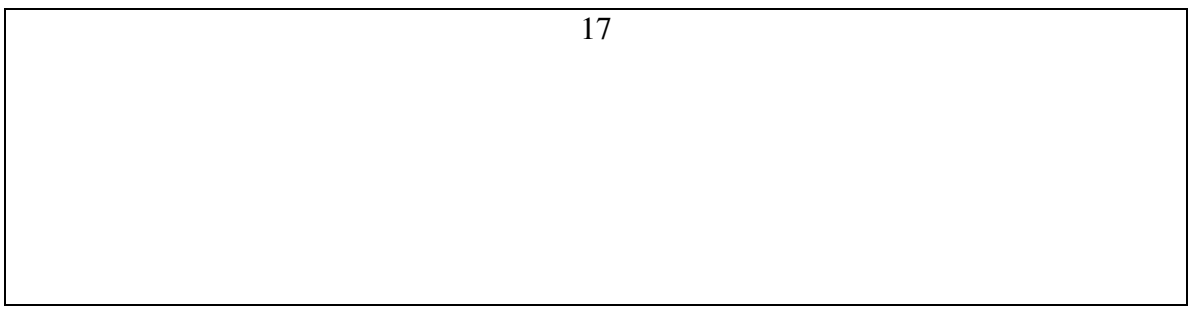
11


15


19


12

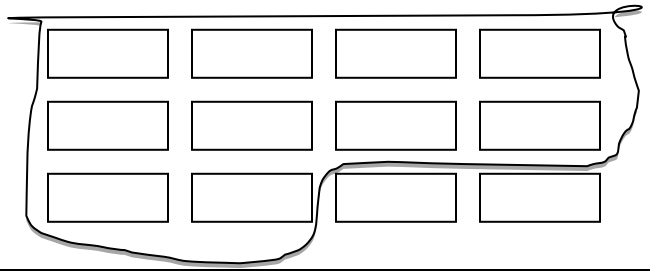

16


17

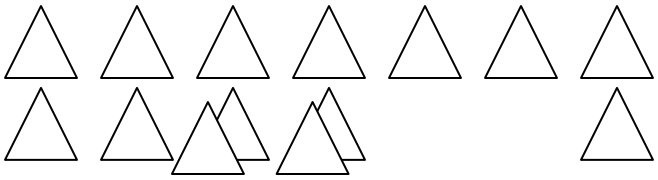
Appendix C

Name _____ Date _____

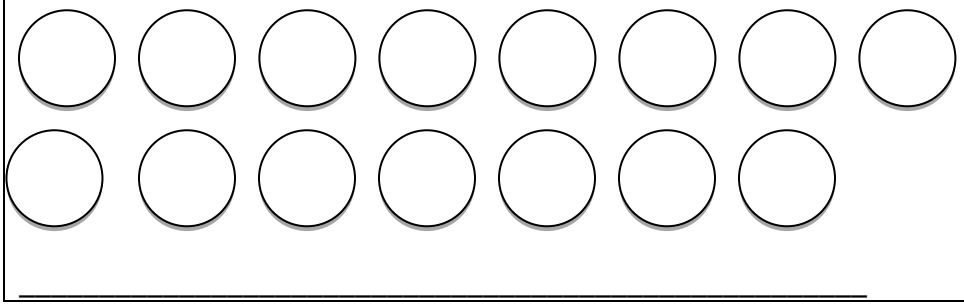
Directions: Circle a group of ten and then count the total number of objects and write a number statement to describe the total number of objects.



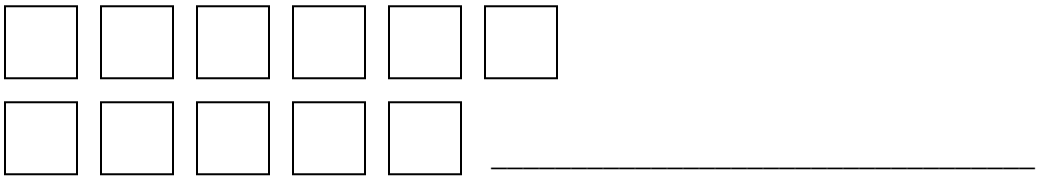
10 + 2 = 12



_____



_____



_____

Appendix D

Common Core Standards

Numbers and Operations in Base Ten - CCSS.MATH.CONTENT.K.NBT.A.1

Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (such as 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

Curriculum Unit Title | *Place Value for Numbers 1-20 in Kindergarten*

Author | Michelle Finegan

KEY LEARNING, ENDURING UNDERSTANDING, ETC.

Place value describes the position of digits in a number to determine what they represent—which size group they count (Van De Walle).
Teen numbers 11-19 can be represented using manipulatives, as well as through explicit numbers (10 and 1 is 11), traditional numbers and through describing the number using place value (1 group of 10 and 2 ones is 12).

ESSENTIAL QUESTION(S) for the UNIT

1. What strategies can students use to count and name teen numbers (11-19)?
2. How can students use ones cubes and tens sticks to make teen numbers?
3. How can students use manipulatives to write number statements to describe numbers 11-20 using ten plus some more?

CONCEPT A	CONCEPT B	CONCEPT C
Recognize and Count Teen Number Names Using Traditional and Explicit Numbers and Through Describing the Number Using Place Value	Place Value Using Tens and Ones	Addition to Show Groups of Ten Plus Some More
ESSENTIAL QUESTION A	**ESSENTIAL QUESTION B**	**ESSENTIAL QUESTION C**
What strategies can students use to count and name teen numbers (11-19)?	How can students use ones cubes and tens sticks, as well as other manipulatives, to make teen numbers?	How can students use manipulatives to write number statements to describe numbers 11-20 using ten plus some more?
VOCABULARY A	**VOCABULARY B**	**VOCABULARY C**
Counting numbers, traditional number names, explicit number names Explicit Number Names- Tell the name of a number using place value such as "one ten and nine ones" for 19.	Place value, tens, ones	Addition, augend, addend, sum, number statement

ADDITIONAL INFORMATION/MATERIAL/TEXT/FILM/RESOURCES

Dream Box Kindergarten Resources for Teachers (http://www.dreambox.com/teachertools)

Math Expressions materials (http://www-k6.thinkcentral.com/ePCLandingPage/#math)

Brainpopjr Math Videos (Number Sense – Place Value; Addition and Subtraction – Making Ten) (www.brainpopjr.com)

Starfall (Base Ten Number and Operations - Base Ten Practice; Compose Decompose; Place Value) (http://more2.starfall.com/m/welcome/first-demo/load.htm?www=first_grade)