Big Idea: Hierarchical Groupings

Hierarchical Groupings is the idea that amounts can be grouped into a system of sets and subsets. We count 11 objects and group them into 1 ten and 1 one, or we can call them 11 ones. Seventy five represents 7 tens and 5 ones.

In order to progress mathematically students need to be able to perceive the place value structures of a number. They need to understand what larger numbers mean. Up to Stage 7, students are immersed in numbers to 20; counting, comparing, combining, composing, and decomposing with multiple solution strategies. Tens are shown as a unit of 10 ones, and then combined with some additional ones to make numbers in the teens. Quantitative questions, involving combining and taking away are related to addition and subtraction, and ten is presented as a strategic amount to use when solving problems.

In Stage 7, Tens are the counters. Using a similar progression as previously, Stage 7 highlights Ten as an important anchor in the number system. Place value concepts begin to take shape visually and meaningfully.

Why are Hierarchical Groupings Important?

Children need experiences with groups of ten as a foundation for the base ten place value system. In Stage 4, they are introduced to ten as a unit. In Stage 7, ten is the basis for the 2-digit numbers they will encounter, the numbers made up of varying groups of ten. A group of things is also a single thing: twenty such things are also two groups of ten. Stage 7 allows children to stay in this introductory environment of tens for as long as they need. When they have shown their fluency in this concept, they progress to place value.

Understanding of the tens place value is developed by challenging students to solve problems where they have to compose and decompose numbers such as 10, 20, and 30.

Stage 7 Learning Progression

Concept	Standard	Example	Description
7.1: Identifying 10s	1.NBT.2	Create '80'	Students were introduced to ten in Stage 4. In Stage 7.1 they show their recognition of how varying bundles of ten combine to make multiples of ten up to ninety. They explore the idea that numbers such as 10, 20, 30, etc., are groups of tens with zero ones.
7.2: Making 10s	1.NBT.2	20, 30, 40, ?	Building on number sense, students work on the order of the decade numbers when counting by tens. The sequence is presented first beginning with 10, and then from any number no higher than 90 when students demonstrate they do not have to begin with 10. Decade sequences have one value missing, and then two values missing. In addition, the placement of the missing positions shift from the last place missing to the first place missing to any place missing as they complete sequences.
7.3: Counting Forward and Backward by 10s	1.NBT.2	70, 60, 50, ?	Using the same order of task presentations as 6.2, students are asked to count the decades backwards by 10s, with numbers 10-90.

7.4: Find '10 more'	1.NBT.5	Make '10 more' than 50	Relative magnitude is explored as students determine, and then know without counting, numbers 'ten more' than any decade number 0-80.
7.5: Find '10 less'	1.NBT.5	Make '10 less' than 40	Relative magnitude is explored as students determine, and then know without counting, numbers 'ten less' than any decade number 10-90.
7.6: Related 1s and 10s combinations	2.OA.2	2 + 5 = ? 20 + 50 = ?	While not all students have mastered their combinations to 10, they work on larger combinations even so. In 7.6, their familiarity and variety of experiences with these smaller combinations come to bear as they consider what happens when adding related pairs that are 10 times larger. Students are expected to use mental strategies when adding and subtracting, one of which is creating easier or known sums to solve a problem with larger numbers. 7.6 allows the students to see how related smaller parts that create a whole come into play when they are ten times larger and therefore create a whole that is ten times larger. Such proportional parts and wholes will come in to play as students work with larger numbers and more advanced mathematics.
7.7: Combinations of 100	1.NBT.4	100 = 30 + ?	Since students are expected to combine hundreds, tens, and ones as a computation strategy, knowing combinations of ten and one hundred automatically serve them to this end. Providing additional opportunities to learn how numbers combine to make 100, Stage 7.7 combines missing addends, missing sums, and the commutative property with the goal being that students become fluent with these pairs; more automatic in recognizing the parts of 100. Gaining automaticity with parts of 100 reinforces an efficient calculation strategy.
7.8: Adding Teens and Ones	1.OA.6	13 + 6 = ?	Composing numbers using ten as a benchmark number shows more flexibility than a dependence on counting. One sort of composition is that of relying on known combinations of parts, 0-10, even when confronted with teens and some more. A student who knows 4 + 3 = 7, shown 14 + 3, can reference his knowledge of the parts and wholes to see the total is 10 + the known combination of 4 + 3, or 7. 14 + 3 = 10 + 7.
7.9: Comparing 10s	1.NBT.2	30 ? 50	Comparing two digit decade numbers shows an understanding of quantities of ten. In order to successfully say which of two numbers is larger, smaller, or same, children examine the amounts of tens and use the greater than (>) and less than (<) and equal sign appropriately.

Using the Extra Practice Worksheets

The Symphony Math Worksheets provide extended practice using the Multiples Ways of Knowing from the Symphony Math program. Students should work through all worksheets in the order given:
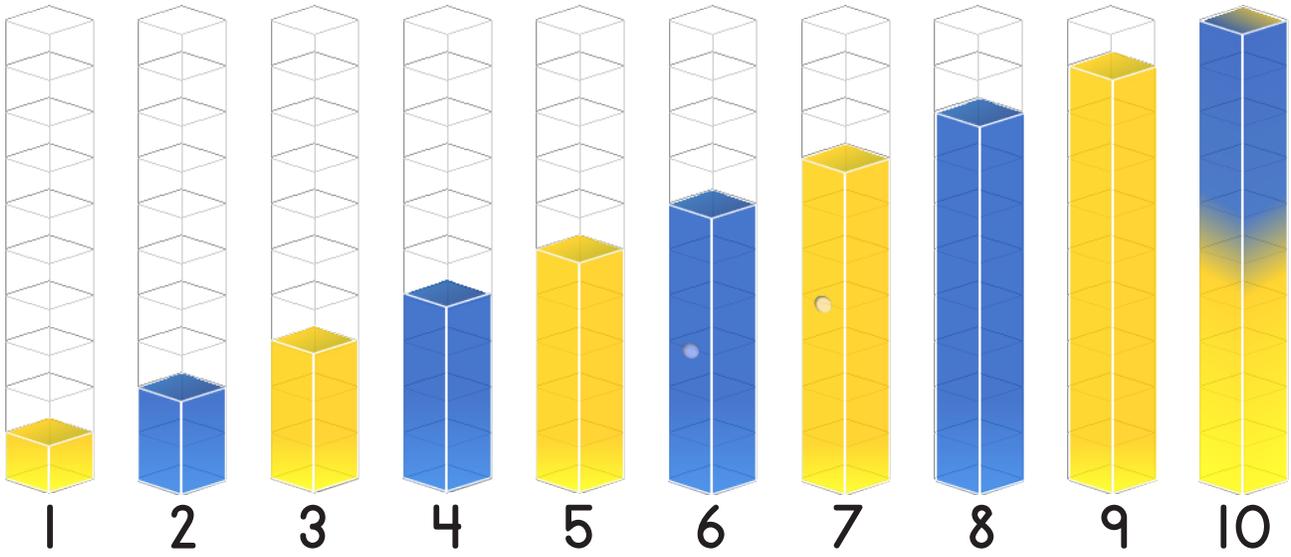
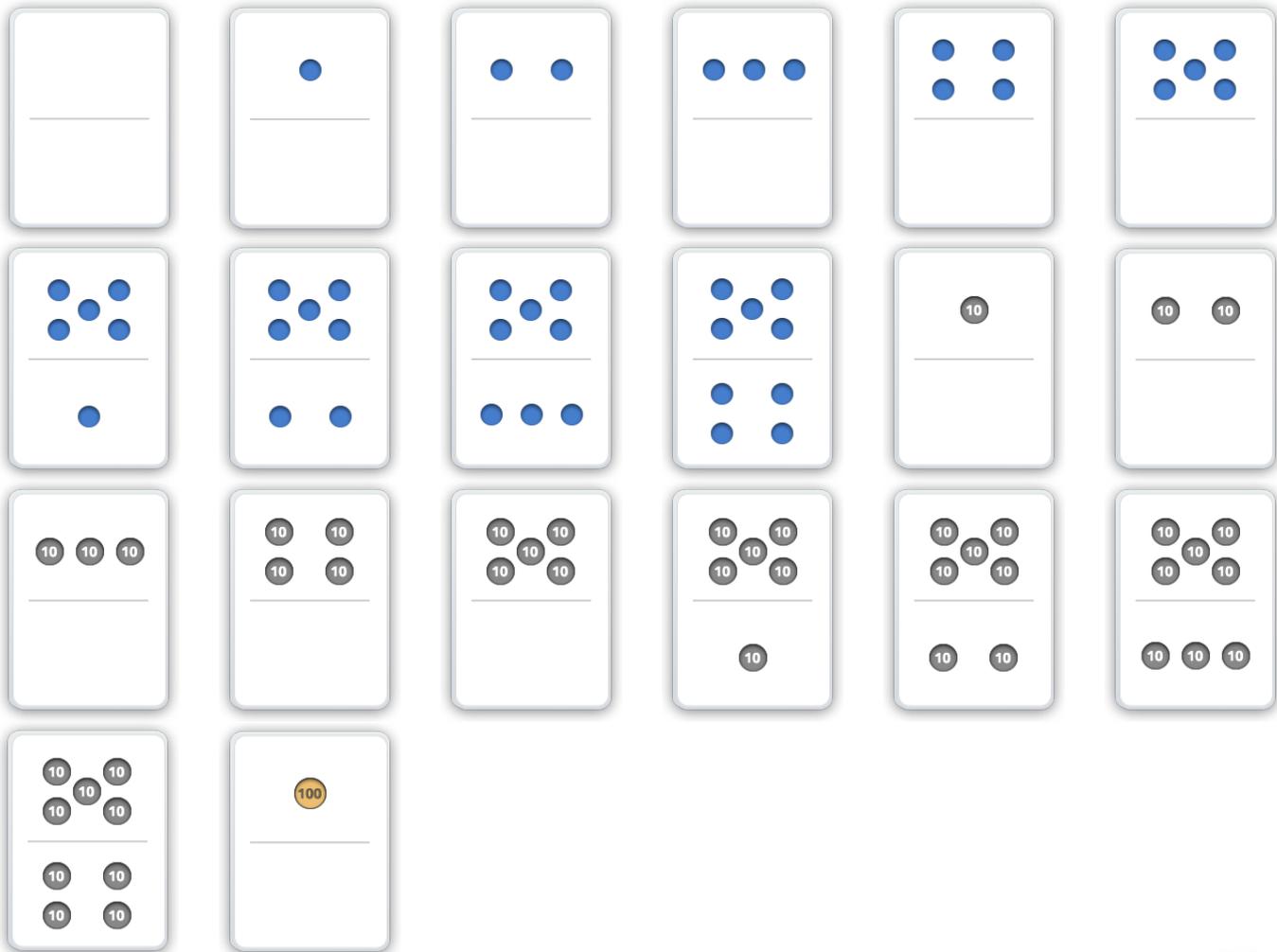| Worksheet	Purpose	Instructions
Manipulatives	Use a visual model to represent the concept.	Create bars, dot cards, or number lines for each item.
Bridge	Connect symbols to their visual representations.	Create objects, numbers, and symbols to complete each item.
Symbols	Understand the concept at the abstract level.	Create numbers and symbols to complete each item.
Apply	Extend understanding to real-life problem solving.	1) Read the story presented at the top of the page. 2) Create a number model of the full solution. 3) Write the number sentence that matches the model.

Group Learning

The Symphony Math Extra Practice materials are designed to promote a conversation about the Big Ideas in math. One-on-one or small group instruction with the materials is recommended for students who need more time to make connections between the mathematical concepts in the Stage and the application of those concepts in their math curriculum.
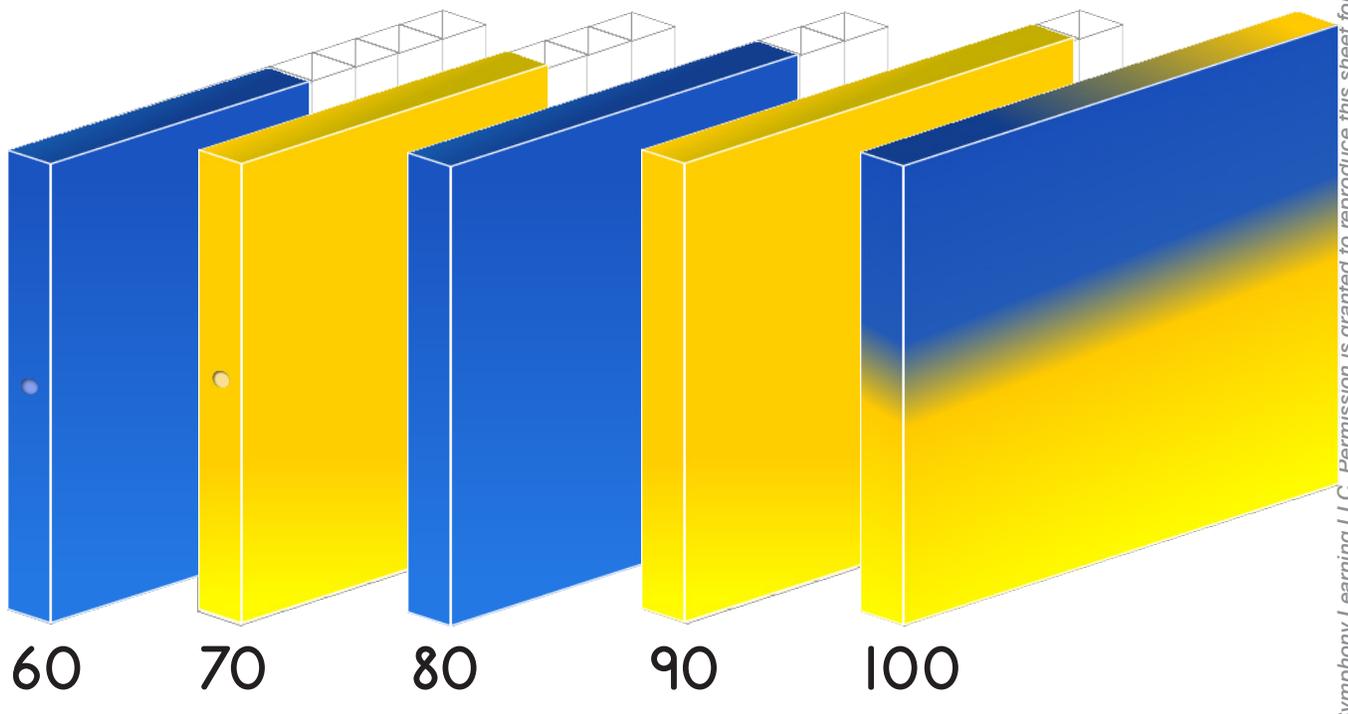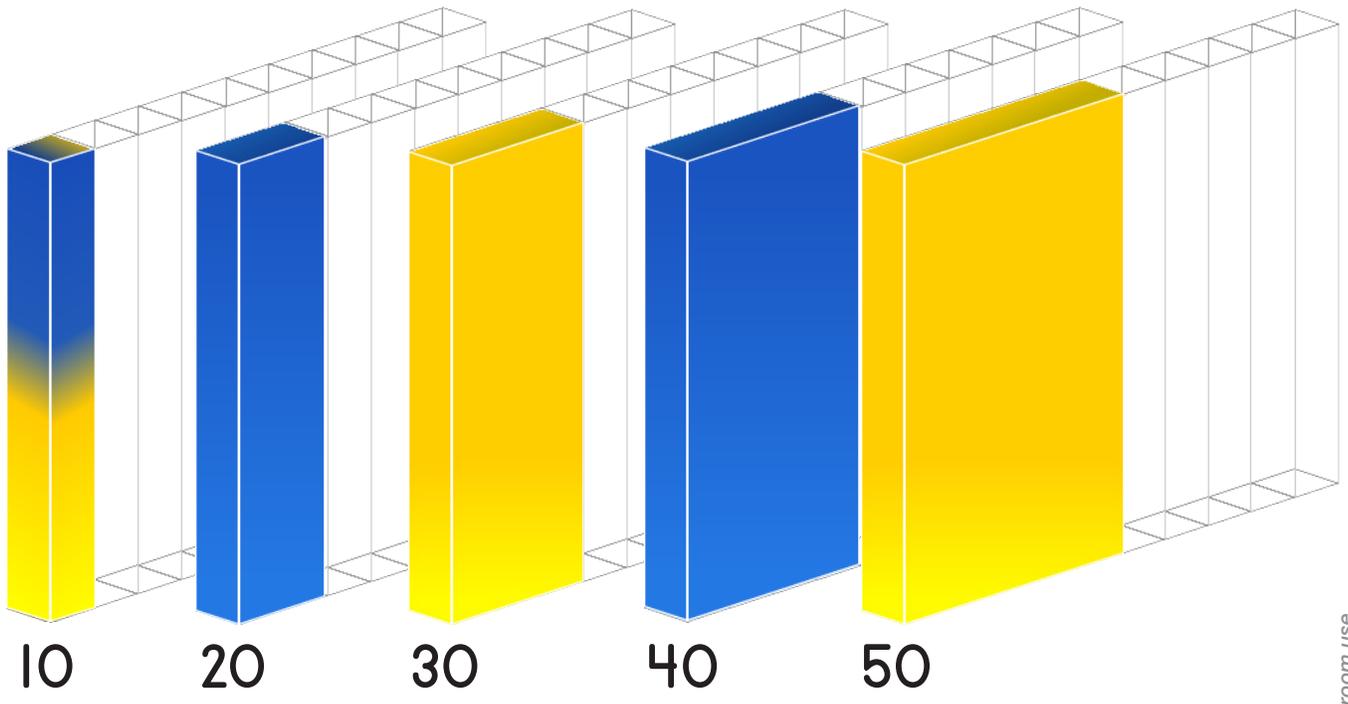
Symphony Bars

1   2   3   4   5   6   7   8   9   10

Dot Cards

10 20 30 40 50

60 70 80 90 100