# GRADE K • MODULE 4

## Number Pairs, Addition and Subtraction to 10

Module 4 marks the next exciting step in math for kindergartners, addition and subtraction! They begin to harness their practiced counting abilities, knowledge of the value of numbers, and work with embedded numbers to reason about and solve addition and subtraction expressions and equations.

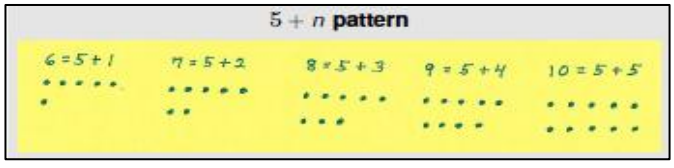
- In Topic A, decompositions and compositions of numbers to 5 are revisited to reinforce how a whole can be broken into two parts and how two parts can be joined to make a whole. Decomposition and composition are taught simultaneously using the number bond model so that students begin to understand the relationship between parts and wholes before adding and subtracting, formally addressed in Topics C and D.

- Topics E, F, and G parallel the first half of the module with the numbers 9 and 10. Topic E explores composition, decomposition, and number pairs using the number bond model. It is essential that students build deep understanding and skill with identifying the number pairs of 6 through 10 as this is foundational to Grade 1's fluency with sums and differences within 10 and Grade 2's fluency with sums and differences to 20.

- Topics F and G deal with addition and subtraction, respectively. Students are refocused on representing larger numbers by drawing the 5 + n pattern to bridge efficiently from seeing the embedded five to representing that as addition.

## Terminology

- Addition (specifically using *add to with result unknown, put together with total unknown, put together with both addends unknown*)
- Addition and Subtraction sentences (equations)
- Make 10 (combine two numbers from 1–9 that add up to 10)
- Minus (–)
- Number bond (mathematical model)
- Number pairs or partners (embedded numbers)
- Part (addend or embedded number)
- Put together (add)
- Subtraction (specifically using *take from with result unknown*)
- Take apart (decompose)
- Take away (subtract)
- Whole (total)



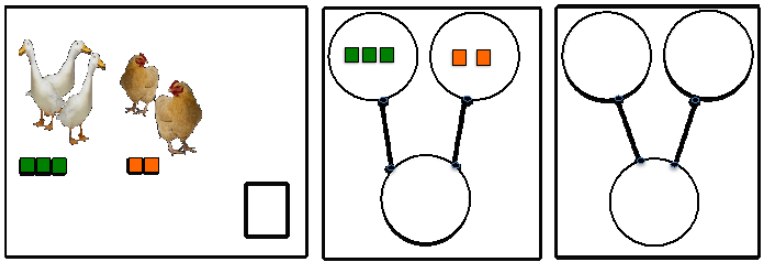
## *Topic A: Compositions and Decompositions of 2, 3, 4, and 5*

In Module 1, students found embedded numbers and experienced decomposition by finding hidden partners. Topic A formally teaches composition and decomposition using number bonds as students explore the relationships between numbers to set the foundation for addition and subtraction.

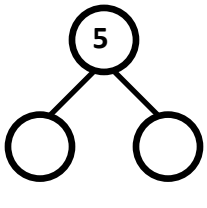
In the first two lessons, students play with composition (3 and 2 make 5) by talking about the number of birds, fingers, and cubes together and decomposition (5 is 3 and 2) by finding embedded numbers in a group. They learn to record the relationships between quantities by drawing pictures in the number bond model.

In Lesson 3, students explore composing number pairs and record their findings using drawings and numerals in the number bond model.

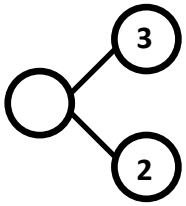
Lesson 4 then has students consider decomposition as a whole separated into number pairs and record their findings using drawings and numerals in the number bond model.



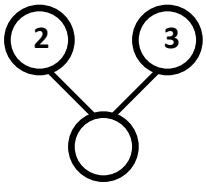
Lesson 5 allows students to use the number bond model as a tool to help them model composition and decomposition. The end goal of this topic is for students to be flexible with the number bond model oriented in various ways and be able to understand the part–part–whole components. By the end of the module, they will understand the number bond's relationship to the accompanying expression or equation.



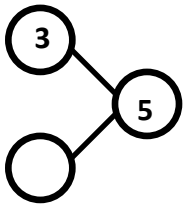

5 = _____ + _____




3 + 2 = _____




2 + 3 = _____




5 – 3 = _____

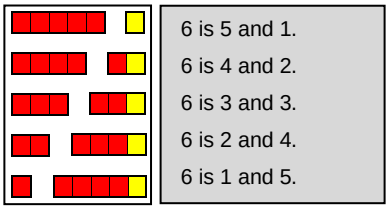
The final lesson of the topic gives students opportunities to move from abstract to concrete by acting out and creating stories based on a given number bond. Throughout Topic A, a fluid movement between composition and decomposition provides a firm foundation for understanding the relationship between addition and subtraction.

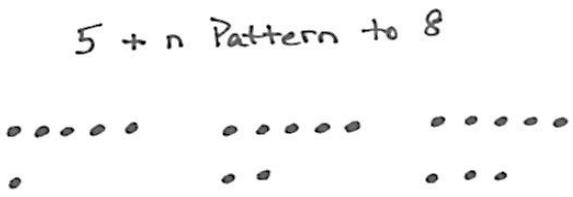
## *Topic B: Decompositions of 6, 7, and 8 into Number Pairs*

Topic B carries forward the work of Topic A, building students' skill with number pairs for 6, 7, and 8, which is cultivated and maintained throughout Topics B and C during Fluency Practice. In the first three lessons of this topic, students decompose 6, 7, and 8. These decompositions are modeled as *put together* situations and represented as addition expressions (C = ___+ ___), as opposed to the *take from* decomposition type (C – B = ___), which will be taught in Topic D.

Lessons 7–9 provide intensive work with decomposing 6, 7, and 8 into number pairs. Students identify all of the pairs using story situations, objects, sets, arrays, and numerals.

In Lessons 10 and 11, students use linking cube sticks to again model the decompositions of 6, 7, and 8 in order to explore the patterns that emerge (pictured below). Throughout, they work with different configurations of the number bond model to support flexible thinking moving from part to whole and whole to part, composition to decomposition.



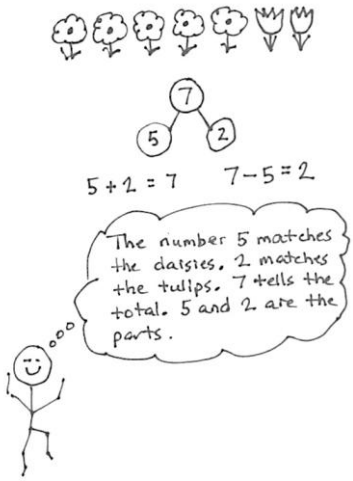




Lesson 12 explores the important 5 + n pattern in 5-groups for 6, 7, and 8 (pictured below). Understanding and usage of the 5-group is foundational for students moving from Level 1 (counting all) to Level 2 (counting on) addition and subtraction strategies.

By the end of this topic, students should have a solid understanding of the relationships between numbers 1–8 and be ready for more formal work with addition and subtraction. Due to the length of this module, there is the option to take a day and a half to administer Topics A and B of the mid-module assessment at the end of Lesson 12. This will identify students who may need more support and allow more time to re-assess these students throughout the module.

## *Topic C: Addition with Totals of 6, 7, and 8*

Topic C introduces formal addition concepts including writing and solving expressions and equations. The first three lessons ask students to represent addition story problems involving decomposition and composition, modeled by A + B = C and C = A + B. In these first formal addition lessons the stories are told with no unknown. "There are 7 apples in the bowl. Five of them are red and 2 of them are green." Students write addition sentences and identify the referent of each number within the problem.




Lessons 13–15 work with 6, 7, and 8 respectively, representing such addition stories with pictures, numbers, and equations.

In Lesson 16, students solve *add to with result unknown* (A + B = ___) word problems within 8. "There were 5 birds in the tree. Three more birds flew to the tree. How many birds are in the tree now?" Students learn to put a box around the equation's unknown.

Lesson 17 teaches *put together total unknown* (also A + B = ___) word problems. On the surface these problems appear similar those of Lesson 16, but lack the embedded *action* of the previous problems. Instead, they focus on a set of objects and part–whole relationships. "There are 4 red toy cars and 3 blue toy cars on the table. How many toy cars are on the table?"

Lesson 18 deals with the last type of addition situation in kindergarten, *both addends unknown* (C = ___+___). Note that this *take apart* situation is modeled with an addition equation. Students are given a total and are asked to find a number pair in the context of an addition story. "There were 8 toy cars. Some are on a shelf and the rest are in a toy box. Write an addition sentence to show how many could be in each place."

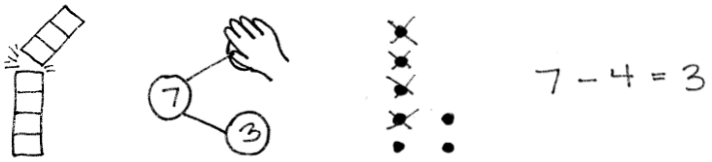
## *Topic D: Subtraction from Numbers to 8*

Topic D introduces formal subtraction concepts including writing and solving expressions and equations

with 6, 7, and 8 with no unknown. Lesson 19 begins at the concrete level with students acting out *take away* stories and working at the pictorial level crossing off to see what remains.

In Lesson 20, the concrete objects and pictorial representations are tied to or matched to the representative subtraction expression or equation using the minus sign with no unknown. As in Topic C, this progression helps students move from concrete processes to reasoning abstractly and quantitatively.

In Lesson 21, students solve subtraction story problems using concrete and pictorial representations and write the corresponding equation. As with addition, it is important that students understand what each numeral in the equation represents from the story situation.




Lessons 22–24 focus on decompositions of 6, 7, and 8, which are recorded as equations. These equations are described in the progressions as *take from with result unknown* (C – B = ___) situations. These three lessons explore the decompositions of 6, 7, and 8 by breaking off a part, hiding a part, and crossing off a part. "There were 7 bears sleeping in a cave. Four bears left to go fishing. How many bears are still in the cave?"

## *Topic E: Decompositions of 9 and 10 into Number Pairs*

Topic E expands student exploration of numerical relationships to include 9 and 10. Returning to work with number bonds after introducing addition and subtraction provides students with a reminder about the part–part–whole relationships that underlie these operations. Students will explicitly discuss the relationship between addition and subtraction in Topic H.

In Lesson 25, students work intensively with the number pairs of 9 as they demonstrate different combinations of sleeping bears and honey-tree hunting bears using counters and record with number bonds.

Lesson 26 gives students the opportunity to decompose 9 into number pairs using representations of fingers, linking cubes, and number bonds. In the Debrief, they explore patterns in the number pairs.

Lessons 27 and 28 follow this same lesson structure for the number 10. In all four lessons, the decompositions are discussed or recorded using number bonds, drawings, and number sentences.

This topic's decomposition situations, like those in Topic B, are *put together both addends unknown* addition equations modeled by the equation C = ___ + ___ .

## *Topic F: Addition with Totals of 9 and 10*

Topic F asks students to connect their understanding of number pairs for 9 and 10 to addition expressions and equations. Core Fluency Practice Sets and Sprints are introduced in this topic to give students practice adding and subtracting numbers to 5 quickly and accurately.

In Lessons 29 and 30, students pictorially represent composition and decomposition addition stories using 5-group drawings and equations with no unknown. Decomposition: "There were 9 flowers. Five were red and 4 were yellow." Composition: "Bob picked 6 red flowers. Then he picked 4 yellow flowers, now he has 10 flowers."

Lesson 31 has opportunities for students to solve *add to with result unknown* and *put together with total unknown* problems with totals of 9 and 10. Both of these problem types are represented by the same equation, A + B = C, with the difference being that *add to result unknown* problem types embed an action within the story. Conversely, *put together with total unknown* problem types join parts with no action. The latter situation is a more complex problem type for kindergartners to consider because there is no movement of one of the parts to support the mental act of joining inherent in addition (e.g., counting on one part to the other one at a time).

The final lesson in the topic deals with the last addition situation for kindergartners, solving *put together* with *both addends unknown* word problems (C = ___ + ___) with totals of 9 and 10 using 5-group drawings, pictures, and equations. All four lessons in this topic correspond to those of Topic C, but with totals of 9 and 10.

This topic builds student understanding of addition within 10 while providing practice with multiple addition situations appropriate for kindergarteners. Due to the length of this module, there is the option to take a day and a half to administer Topics E and F of the end-of-module assessment at the end of Lesson 32. This will identify students who may need more support and allow more time to reassess these students throughout the module.

## *Topic G: Subtraction from 9 and 10*

Topic G provides additional practice with formal subtraction concepts, including writing and solving number sentences with totals of 9 or 10.

Lesson 33 moves quickly through concrete and pictorial representations of subtraction with students representing *take from* equations (C − B = A), with no unknown for totals to 10. "There were 10 cars in the parking lot. Two of them drove away. Now there are 8 cars left in the parking lot."

In Lesson 34, students solve subtraction story problems by breaking off, crossing out, and hiding a part and show their strategies with drawings and number sentences. "I have 9 pencils. I'm going to hide 3 pencils in a box. How many pencils are not in the box?"

Lessons 35–36 focus on decompositions of 9 and 10 using 5-groups, which are recorded as number sentences. These decompositions differ from those in Topic F in that they are represented as subtraction number sentences (C – B = A) instead of addition sentences (C = __ + __ ).

Students continue to focus on the grade level fluency goal during Fluency Practice, improving the speed and accuracy with which they can add and subtract numbers to 5.

## *Topic H: Patterns with Adding 0 and 1 and Making 10*

After addition and subtraction have been introduced, Topic H explores the behavior of zero: the additive identity. Students learn that adding or subtracting zero does not change the original quantity. Students will also begin to see patterns when adding 1 more and the inverse relationship between addition and subtraction (8 + 2 = 10, and 10 – 2 = 8). Finally, students will begin to formally study and explore partners to 10, though this essential work has been supported throughout Module 4 during Fluency Practice.