Topic D

The Meaning of Even and Odd Numbers

2.OA.3

Focus Standard:		2.OA.3	Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.
Instructional Days:		4	
Coherence	**-Links from:**	G2–M5	Addition and Subtraction Within 1,000 with Word Problems to 100
	-Links to:	G3–M4	Multiplication and Area

In Topic D, students explore the meaning of even and odd numbers, learning various interpretations and relating these interpretations to addition. Lesson 17 introduces even numbers via doubles. In other words, when we double any number from 1 to 10, the resulting number is even, and any even number can be written as a doubles fact. Students arrange doubles into rectangular arrays (e.g., 2 rows of 7, or 2 sevens) and write an equation to show the total as a sum of two equal addends (e.g., 7 + 7 = 14). They discover that doubles facts yield even numbers even when the number being doubled is odd.

In Lesson 18, students pair up to 20 objects and see that when objects are paired with none remaining, the number is even (**2.OA.3**). They see that objects arranged in columns of two also create two equal groups. For example, a 2 by 7 array may be seen as 7 columns of 2, or 2 rows of 7. Students also see that even numbers occur when we count by twos (e.g., 1 two, 2 twos, …7 twos, or 2, 4, 6, …14). They count by twos up to 20 and then back down. When they reach zero, the question is posed: "Does this mean zero is even? Can I write 0 as a doubles fact?" As a result, students see that 0 is even. This practice lays the groundwork for the multiplication table of two in Grade 3.

By Lesson 19, students have a keen understanding of how to determine whether or not a number is even. Now they learn a faster way to identify even numbers, by looking for 0, 2, 4, 6, or 8 in the ones place. They circle the multiples of two on a number path and make the observation that the ones digits are 0, 2, 4, 6, and 8. Then, students revisit the number path: Would the pattern continue past 20? They continue counting by twos to see that the pattern continues. They then discern whether or not a larger number is even, and they prove their findings by using the interpretations taught in the previous lessons. For example, a student may say, "20 is even. It has a zero in the ones place and is made of 2 tens." This reasoning demonstrates that the student is flexible in recognizing and interpreting even numbers. Once students work with various interpretations of even numbers, they are ready to name all other whole numbers as odd. They learn that

odd numbers can be identified in contrast to even (i.e., if a number is not even, then it is odd). They also learn that when one is added to or subtracted from any even number, the resulting number is odd.

Topic D culminates with students using arrays to investigate even and odd numbers. Students build arrays, as they did in Lesson 17, using even numbers, and they see concretely that when a number is even, it can be decomposed into two equal parts or groups of two. They then either remove or add on 1 square unit to make an odd number. This enables students to solidify the understanding that an odd number is either one more or one less than an even number, and that it cannot be decomposed into two equal groups or groups of two, although it may be decomposed into more than two groups (e.g., a 3 by 3 array). Students add even numbers to other even numbers, odd numbers to other odd numbers, and even numbers to odd numbers to see what happens to the sum in each case: that the sum of two even numbers is even, the sum of two odd numbers is even, and the sum of an odd number and an even number is odd. Through these explorations, students build an intuitive understanding of prime, composite, and square numbers, which will be foundational for later grade levels.

A Teaching Sequence Towards Mastery of the Meaning of Even and Odd Numbers	
Objective 1:	**Relate doubles to even numbers, and write number sentences to express the sums. (Lesson 17)**
Objective 2:	**Pair objects and skip-count to relate to even numbers. (Lesson 18)**
Objective 3:	**Investigate the pattern of even numbers: 0, 2, 4, 6, and 8 in the ones place, and relate to odd numbers. (Lesson 19)**
Objective 4:	**Use rectangular arrays to investigate odd and even numbers. (Lesson 20)**