Math: Characteristics of Even and Odd Numbers

**Enduring Understandings:** (What big idea(s) will students understand as a result of this lesson?)

- Numbers have characteristics
- Patterns in manipulating numbers

**Essential Questions:** (What question(s) will students grapple with as they learn through this lesson?)

- Common misconceptions: Are all prime numbers odd?
- How can I connect this new information to what we’ve been learning about odd and even numbers?
- Are the patterns the same as numbers increase?
- Why do two odd numbers always add up to an even number?

**Primary Content Objectives:**

Students will **know:** (facts/information)

- Vocabulary: odd, even, multiples, divisible, sum, array
- Rules for adding odd and even numbers:
  - Odd + Odd = Even
  - Even + Even = Even
  - Odd + Even = Odd

Students will be able to **do:** (skills and behaviors)

- Model odd and even numbers
- Visualize what an odd and even number looks like
**Related state or national standards:** (Examples include State Standards of Learning, Common Core State Standards, Next Generation Science Standards or National Curriculum Standards for Social Studies)

5.3 The student will identify and describe the characteristics of prime and composite numbers; and identify and describe the **characteristics of even and odd numbers.**

**Assessment:** (How (and when) will students be assessed? What evidence will you collect to determine whether students have met the lesson objectives? Will the assessment(s) be a pre-assessment (diagnostic), formative (ongoing feedback) or summative?)

Students will be (informally) assessed throughout the lesson. During the discovery portion of the lesson (using unifix cubes), teachers will circle around the room asking questions like “How do you know that shape is an odd number?” After students have modeled even and odd numbers with the cubes, we will work together to write the rules of even and odd numbers. Students will complete a sorting worksheet using the rules.

**Materials and Resources:** (List here all materials that you will need in order to successfully teach this lesson. Include technology and website links, texts, graphic organizers, student handouts, physical manipulatives, etc.)

- Prime sieve for reference
- Math warm-up worksheet
- Unifix cubes for each table
- Sort worksheets

**Key Vocabulary and Definitions:**

**Odd:** Does not have 2 as a factor; not divisible by 2; has an odd number in the ones place (1, 3, 5, 7, 9)

**Even:** Has an even number (2, 4, 6, 8) or zero in the ones place; has 2 as a factor; divisible by 2

**Factor:** Numbers you can multiply together to get another number

**Multiple:** The result of multiplying a number by another number

**Divisible:** When one number can be divided by another number, and the result is an exact whole number; when one number can be split evenly

**Sum:** Result of adding two or more numbers together

**Array:** Items arranged in rows and columns

**Lesson Procedures:**
1. Introduction and goal orientation:

Introduce the lesson with the common misconception (held by many of these students): “All prime numbers are odd.” Return to the question at the end of the lesson.

2. Connecting to prior knowledge and experiences: (Questions or activities that help students make links)

Warm-up activity: Students will be given a number puzzle to complete after transitioning from ST Math. Clues include “The number is even and is between 51 and 75. Color it orange.” This activity will review place value (by identifying numbers that fall between two numbers) and will serve as a warm-up for identify odds and evens, which they should be familiar with.

Throughout the lesson, the teacher will make connections between odd and even numbers and prime and composite numbers, which they’ve been learning about (not all prime numbers are odd). We will also review divisibility rules (from Tuesday’s lesson) because even numbers must be divisible by 2/have 2 as a factor/be a multiple of 2. Students should understand that there are many overlapping patterns.

3. Tasks and activities: (What challenging tasks and activities will students engage in as they construct knowledge, learn new skills or behaviors and develop understandings?)

Discovery of patterns between odds and evens using unifix cubes (done in pairs):

- Have students tell you the first 5 odd numbers: 1, 3, 5, 7, 9
- To have students learn to visualize what an odd number looks like, have them make these odd numbers (1, 3, 5, 7, 9) with unifix cubes.

![Unifix Cubes for Odd Numbers]

- Have them make additional odd numbers and then generalize that the shape made by an odd number always has one cube sticking out which cannot be paired with another cube. Challenge them to work as a table to make the biggest odd number-shape! How do they know it’s odd?
- Now have students tell the first five even numbers: 2, 4, 6, 8, 10
- Have them make these first five even numbers with unifix cubes as follows:

![Unifix Cubes for Even Numbers]
• Have them make additional even numbers and then generalize that the shape made by an even number always has cubes that match up perfectly. Ask students to relate these rectangles (arrays) to arrays we made while finding factors.
• Put these two shapes on the board. Have students tell which would represent an odd number and which would represent an even number.

• Tell students that they will now discover what happens when you add even and odd numbers. Have them take the shape made by the number 3 and the shape made by the number 5. Have them put them together by rotating one of the shapes.

• Have them add several more odd numbers together in a similar fashion. Then have them generalize what happens when you add two odd numbers. Odd + odd = even
• Now have them put together the even number 2 and the odd number 3.

Have them add several more even and odd numbers together in a similar fashion. The have them generalize what happens when you add an even and odd number together. Odd + even = odd.

• Finally, have them put the shapes together for two even numbers. After doing several, have them generalize what happens when you add two even numbers. Even + even = even.
• To further firm up the mental picture of what happens when you add even and odd numbers, take the two shapes, which represent even and odd numbers. Show them what happens when you add an even and odd.

• Show them what happens when you add two evens.

• By rotating one shape, show them what happens when you add two odd numbers.
• Have several students tell the 3 rules for adding even and odd numbers.
• Conclude the lesson by giving them this helpful hint. **Knowing these rules will help you spot check answers to addition examples you work.** For example, if you add two even numbers, your answer must be even. If it's not, you’ve made a mistake and need to go back and rework. **This also helps you to eliminate wrong answers on standardized tests.** If you add two odd numbers, you know you can eliminate any answers, which are odd.

The idea for this lesson came from www.europa.com

4. **Closure:** (How will you wrap up the lesson and reinforce key ideas? Closure may include some form of assessment or exit slip)

   Return to the misconception that was introduced at the beginning.

   Depending on time, students should work together using their unifix cubes and rules that we came up with as a class to complete the sort (consists of definitions, examples, and rules to be sorted under “Odd” or “Even).”

(Credit: The framework for this lesson plan follows the Understanding by Design approach to lesson planning, Wiggins & McTighe, 2004)