Cluster 4: Understanding Place Value and Decimals in the Context of Metric Measurement

***Duration*:** 3-4 weeks

Content Standards:
This list includes standards that will be addressed in this cluster, but not necessarily mastered, since all standards are benchmarks for the end of the year. Please note strikethroughs and recommendations in the Important Considerations section for more information.

NC.5.NBT.1
Explain the patterns in the place value system from one million to the thousandths place.
- Explain that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
- Explain patterns in products and quotients when numbers are multiplied by 1,000, 100, 10, 0.1, and 0.01 and/or divided by 10 and 100.

NC.5.NBT.3
Read, write, and compare decimals to thousandths.
- Write decimals using base-ten numerals, number names, and expanded form.
- Compare two decimals to thousandths based on the value of the digits in each place, using >, =, and < symbols to record the results of comparisons.

NC.5.MD.2
Represent and interpret data.
- Collect data by asking a question that yields data that changes over time.
- Make and interpret a representation of data using a line graph.
- Determine whether a survey question will yield categorical or numerical data, or data that changes over time.

Mathematical Practices:
1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

What is the mathematics?
- Students increase their number sense about larger and smaller numbers with experiences estimating (ex. How many tennis balls fit in this shoe box? How many would tennis balls would you estimate fit in our classroom? How much space would you need for 1,000,000 tennis balls?)
- Students build on their knowledge of multiplicative comparison from grade four to explore place value from one million to thousandths. They use various tools (ex. Calculator, zoomable number lines, meter sticks, place value blocks) to notice patterns when a number is continually multiplied or divided by ten to discover that a digit in one place is ten times as much as the digit to the right and ten times less than the digit to the left.
- Students continue to apply place value concepts to solve metric conversion problems using a conversion table (Grade 4 standard).
- Students use the meter stick as a length model to further explore decimal place values (ex. Roll dice and line up base ten blocks against a meter stick to "Race to a Meter" recording

centimeter cubes as hundredths and decimeter cubes as tenths; measure lengths of long jumps), etc.)
- Students compare decimals to thousandths using length and area models using >, =, and < symbols to record the results of comparisons (ex. Who jumped the farthest? Whose race time was the fastest?)
- Students collect data using metric measurement that yields change over time and use it to make and interpret line graphs (ex. plant growth each day using millimeters as thousandths, centimeters as hundredths; rainfall in milliliters; what the class drinks each day in liters).

Important Considerations:
- This cluster extends on the place value ideas that students explored in Grade 4 (100,000 to hundredths) to larger and smaller numbers (1,000,000 to thousandths).
- Students need ample opportunities to explore concepts with concrete models (meter sticks, place value blocks, number lines) to build a strong conceptual understanding of place value.
- Measurement work can be done in the context of data to provide some review from Cluster 1. Students can collect, analyze, and graph measurements to answer a question.
- As students are making conjectures when looking for patterns as they multiply by ten, be sure to help them refine their mathematical language so that their statements are accurate. Students often notice that when they multiply a number by ten a zero is added to the end. This pattern is only true for whole numbers, however. This can create a misconception later as students begin working with decimals. Helping introduce counterexamples (ex. Does your "zero at the end" idea work with fractions? With decimals?) can help students refine their statements. With experience they will begin to refine their own and each other's statements, gaining experience in Mathematical Practice 6, attending to precision.
- In Cluster 6 students will have more experience with measurement and conversion problems in both the customary and metric systems. In this cluster, metric measurement is a context to further examine place value and comparison of decimals.