Topic A

Multiplicative Patterns on the Place Value Chart

5.NBT.1, **5.NBT.2, 5.MD.1**

Focus Standards:	5.NBT.1	Recognize 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.
	5.NBT.2	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.
	5.MD.1	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.
Instructional Days:	4	
Coherence -Links from:	G4–M1	Place Value, Rounding, and Algorithms for Addition and Subtraction
-Links to:	G6–M2	Arithmetic Operations Including Dividing by a Fraction

Topic A begins with a conceptual exploration of the multiplicative patterns of the base ten system. This exploration extends the place value work done with multi-digit whole numbers in Grade 4 to larger multi-digit whole numbers and decimals. Students use place value disks and a place value chart to build the place value chart from millions to thousandths. They compose and decompose units crossing the decimal with a view toward extending their knowledge of the *10 times as large* and *1/10 as large* relationships among whole number places to that of adjacent decimal places. This concrete experience is linked to the effects on the product when multiplying any number by a power of ten. For example, students notice that multiplying 0.4 by 1,000 shifts the position of the digits to the left three places, changing the digits' relationships to the decimal point and producing a product with a value that is $10 \times 10 \times 10$ as large (400.0) (**5.NBT.2**). Students explain these changes in value and shifts in position in terms of place value. Additionally, students learn a new and more efficient way to represent place value units using exponents (e.g., 1 thousand = 1,000 = 10^3) (**5.NBT.2**). Conversions among metric units such as kilometers, meters, and centimeters give students an opportunity to apply these extended place value relationships and exponents in a meaningful context by exploring word problems in the last lesson of Topic A (**5.MD.1**).

A Teaching Sequence Toward Mastery of Multiplicative Patterns on the Place Value Chart

Objective 1: Reason concretely and pictorially using place value understanding to relate adjacent base ten units from millions to thousandths.
(Lesson 1)

Objective 2: Reason abstractly using place value understanding to relate adjacent base ten units from millions to thousandths.
(Lesson 2)

Objective 3: Use exponents to name place value units, and explain patterns in the placement of the decimal point.
(Lesson 3)

Objective 4: Use exponents to denote powers of 10 with application to metric conversions.
(Lesson 4)