Place Value

A Fifth Grade Learning Focused Unit Using the Engage NY Module Math Grade 5-M1

Unit Topic: Place Value

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. Perform operations with multi-digit whole numbers and with decimals to hundredths. 5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.
Convert like measurement units within a given measurement system.
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.

Learning Progressions:

In this unit students' understanding of the patterns in the base ten system are extended from fourth grade concepts with place value of multi-digit whole numbers and decimals to hundredths to the thousandths place. In Grade 5, students deepen their knowledge through a more generalized understanding of the relationships between and among adjacent places on the place value chart, e.g., 1 tenth times any digit on the place value chart moves it one place value to the right. The learning goal for the entire unit will be for students to apply these new understandings as they reason about and perform decimal operations through the hundredths place.

Focus Standards for Mathematical Practice
MP.6 Attend to precision. Students express the units of the base ten system as they work with decimal operations, expressing decompositions and compositions with understanding, e.g., "9
hundredths + 4 hundredths = 13 hundredths. I can change 10 hundredths to make 1 tenth."
MP.7 Look for and make use of structure. Students explore the multiplicative patterns of the base
ten system when they use place value charts and disks to highlight the relationships between adjacent places. Students also use patterns to name decimal fraction numbers in expanded, unit, and word forms.
MP.8 Look for and express regularity in repeated reasoning. Students express regularity in repeated reasoning when they look for and use whole number general methods to add and subtract decimals and when they multiply and divide decimals by whole numbers. Students also use powers of ten to explain patterns in the placement of the decimal point and generalize their knowledge of rounding whole numbers to round decimal numbers

Decision 6: Acquisition Lesson #1
(Lesson plan necessary for student learning. You will have multiple Acquisition Lessons within a unit.

Not all parts need to be filled in; use only those applicable.)

Lesson Essential Question	How can you describe the relationship between two place value positions?
Time (In Days)	1
Activating Thinking (Hook to motivate, link to prior knowledge)	Using iTools the teacher will model tens to 100. The teacher will record the numbers on the board. Students will be asked to explain how they recognized multiples of 10. Students will then perform a "sprint" which will focus on multiplying by 10.
Acceleration/Previewing (Preview of key vocabulary, concepts, and skills prior to learning)	Period
Teaching Activities and Strategies (Examples: Collaborative Pairs; Distributed Guided Practice; Distributed Summarizing; Graphic Organizers) Key Questions: Add throughout the lesson	1. Rename the Units. Students will be given ones and will have to convert them to tens. Examples will include 10, 20, 30, 50, 230, 470, 560, 640, 890, 910…… 2. The teacher will review with students the values of each type of base ten block and the relationship from one type to the next. Teacher will teach that each base ten block is one tenth of the base ten block to its left. 3. Students will be given place value charts to use to find numbers that are ten times as much or one tenth as much of the original numbers. How can we show 1 million using hundred thousands? Work with your partner to show this on your chart. Students will work with partners to divide each place by ten. Students will complete the sequence until they reach the hundredth place. Students will be asked to determine the patterns they notice. 4. Students will work in small groups to jigsaw and answer two of these questions. They will then jigsaw again and share out their solutions. They will compare and contrast their solutions with the new members of the groups. 5. Compare the solutions you found when multiplying by 10 and dividing by 10 (3.452 10 and 345 ÷ 10). How do the solutions of these two expressions relate to the value of the original quantity? How do they relate to each other? 6. What do you notice about the number of zeros in your products when multiplying by 10, 100, and 1,000 relative to the number of places the digits shift on the place value chart? What patterns do you notice?
Summarizing Strategies (Learners summarize and answer LEQ)	How can you describe the relationship between the million and the hundred thousands position? Students will write a letter to an absent student and explain.

Extending/Refining Activities	Students will be asked to write a number that has four digits with the same number in all the places, such as 4,444. Students will circle the digit with the greatest value and underline the digit with the smallest value.
Assignment and/or Assessment	Farmer Jim keeps 12 hens in every coop. If Farmer Jim has 20 coops, how many hens does he have in all? If every hen lays 9 eggs on Monday, how many eggs will Farmer Jim collect on Monday? Explain your reasoning using words, numbers, or pictures
Re-Teaching Focus & Strategy	Place Value Chart will be used as needed
Differentiation	Teacher will extend the places for students who need an additional challenge
Review & Revise (Teacher Reflection)	
Resources & Materials	Base Ten Blocks, Website

Decision 6: Acquisition Lesson #2

(Lesson plan necessary for student learning. You will have multiple Acquisition Lessons within a unit. Not all parts need to be filled in; use only those applicable.)

Unit Topic:

Standards:
Anchors:

Lesson Essential Question	How do you read, write, and represent whole numbers through the millions place?
Time (In Days)	1
Activating Thinking (Hook to motivate, link to prior knowledge)	The teacher will introduce the lesson by discussing the sun's size and it's location in our solar system. Explain that the distances between the sun and the planets are very large numbers. Practicing skip-counting on the number line builds a foundation for accessing higher order concepts throughout the year. Direct students to count forward and backward by threes to 36, emphasizing the transitions of crossing the ten. Direct students to count forward and backward by fours to 48, emphasizing the transitions of crossing the ten.

	Take Out the Tens (2 minutes) Materials: (S) Personal white board Note: Decomposing whole numbers into different units lays a foundation to do the same with decimal fractions. T: (Write 83 ones = ____ tens ____ ones.) Write the number sentence. S: (Write 83 ones = 8 tens 3 ones.) Repeat the process for 93 ones, 103 ones, 113 ones, 163 ones, 263 ones, 463 ones, and 875 ones.
Acceleration/Previewing (Preview of key vocabulary, concepts, and skills prior to learning)	Products, factors, decomposing, units
Teaching Activities and Strategies (Examples: Collaborative Pairs; Distributed Guided Practice; Distributed Summarizing; Graphic Organizers) Key Questions: Add throughout the lesson	1. A school district ordered 247 boxes of pencils. Each box contains 100 pencils. If the pencils are to be shared evenly among 10 classrooms, how many pencils will each class receive? Draw a place value chart to show your thinking. 2. Problem Set: 367 × 10 367 ÷ 10 4,367 × 10 4,367 ÷ 10 Work with your partner to solve these problems. Write two complete number sentences on your board. Students will be asked to explain how they got their answer and will be asked to compare and contrast the answers.
Summarizing Strategies (Learners summarize and answer LEQ)	When dividing by 10, what happens to the digits in the quotient? What multiplying by 100, what happens to the digits in the product?
Extending/Refining Activities	. Solve. a. 32.1 × 10 = _____ b. 3632.1 ÷ 10 = _____ 2. Solve. a. 455 × 1,000 = _____ b. 455 ÷ 1.000 = _____ Students will work in pairs to complete error analysis. They will complete the problems independently and will then compare and contrast their answers. They will analyze their partners work for errors. If the students answers differ they will need to prove their answers.

Assignment and/or Assessment	. Solve. a. 54,000 × 10 = _____ b. 54,000 ÷ 10 = _____ c. 8.7 × 10 = _____ d. 8.7 ÷ 10 = _____ e. 0.13 × 100 = _____ f. 13 ÷ 1,000 = _____ g. 3.12 × 1,000 = _____ h. 4,031.2 ÷ 100 = _____ 2. Find the products. a. 19,340 × 10 = _____ b. 19,340 × 100 = _____ c. 19,340 × 1,000 = _____ d. Explain how you decided on the number of zeros in the products for (a), (b), and (c).
Re-Teaching Focus & Strategy	Janice thinks that 20 hundredths is equivalent to 2 thousandths because 20 hundreds is equal to 2 thousands. Use words and a place value chart to correct Janice's error. 5. Canada has a population that is about as large as the United States. If Canada's population is about 32 million, about how many people live in the United States? Explain the number of zeros in your answer
Differentiation	Teacher will extend the places for students who need an additional challenge
Review & Revise (Teacher Reflection)	Exit Tickets: Teacher will analyze for understanding. Alaska has a land area of about 1,700,000 square kilometers. Florida has a land area $1/10^{th}$ the size of Alaska. What is the land area of Florida? Explain how you found your answer.
Resources & Materials	Engage NY Module

Decision 6: Acquisition Lesson #3

(Lesson plan necessary for student learning. You will have multiple Acquisition Lessons within a unit. Not all parts need to be filled in; use only those applicable.)

Unit Topic:

Standards:
Anchors:

Lesson Essential	How do I use exponents to name place value units, and explain

<table>
<tr><td>Question</td><td>patterns in the placement of the decimal point.</td></tr>
<tr><td>Time (In Days)</td><td>2 Days</td></tr>
<tr><td>Activating Thinking
(Hook to motivate, link to prior knowledge)</td><td>(Write 9 tenths = ____.) Complete the number sentence by saying the unknown value as a decimal.
S: 0.9
T: (Write 10 tenths = ____.)
S: 1.0
T: (Write 11 tenths = ____.)
S: 1.1
T: (Write 12 tenths = ____.)
S: 1.2
T: (Write 18 tenths = ____.)</td></tr>
<tr><td>Acceleration/Previewing
(Preview of key vocabulary, concepts, and skills prior to learning)</td><td>Jack and Kevin are creating a mosaic for art class by using fragments of broken tiles. They want the mosaic to have 100 sections. If each section requires 31.5 tiles, how many tiles will they need to complete the mosaic?
Explain your reasoning with a place value chart.</td></tr>
<tr><td>Teaching Activities and Strategies
(Examples: Collaborative Pairs; Distributed Guided Practice; Distributed Summarizing; Graphic Organizers)

Key Questions: Add throughout the lesson</td><td>1. Teacher will draw and project a powers of ten chart.
The teacher will model the 100 and tens (100 times 1, 10 times 1)
The class will work collaboratively to the millions place. The class will use exponents as well as multiplying by ten.
<table>
<tr><td>1,000,000</td><td>100,000</td><td>10,000</td><td>1,000</td><td>100</td><td>10</td></tr>
<tr><td>(10 × 10 × 10) × (10 × 10 × 10)</td><td>10 × 10 × (10 × 10 × 10)</td><td>10 × (10 × 10 × 10)</td><td>(10 × 10 × 10)</td><td>10 × 10</td><td>10 x1</td></tr>
<tr><td>10 to the 6th power</td><td>10 to the 5th power</td><td>10 to the 4th power</td><td>10 to the 3rd power</td><td>10 to the 2nd power</td><td>10 to the first power</td></tr>
</table>
After reviewing the chart with the students, challenge them to multiply 10 one hundred times. As some start to write it out, others may write 10100, a googol, with exponents.
Now, look at the place value chart. Let's read our powers of 10 and the equivalent valuesA googol has 100 zeros. Write it using an exponent on your personal board.
2. Write ten to the fifth power as a product of tens.
: Find the product.10 × 100
1. : Write 700 ÷ 102 without using an exponent, and find the quotient. Write it on your personal board. If you know that 700 ÷ 100 equals 7, then what is 700 ÷ 102
2. Turn and explain to your partner</td></tr>
</table>

Summarizing Strategies (Learners summarize and answer LEQ)	How can you use properties of operations to solve problems? Write a letter to an absent student explaining.
Extending/Refining Activities	Error Analysis: 6. Shaunnie and Marlon missed the lesson on exponents. Shaunnie incorrectly wrote 105= 50 on her paper, and Marlon incorrectly wrote 2.5 × 102= 2.500 on his paper. a. What mistake has Shaunnie made? Explain using words, numbers, or pictures why her thinking is incorrect and what she needs to do to correct her answer. b. What mistake has Marlon made? Explain using words, numbers, or pictures why his thinking is incorrect and what he needs to do to correct his answer.
Assignment and/or Assessment	What is an exponent, and how can exponents be useful in representing numbers How would you write 1,000 using exponents? How would you write it as a multiplication sentence using only 10 as a factor? Explain to your partner the relationship we saw between the exponents and the number of the places the digits shift when you multiplied or divided by a power of 10. □
Re-Teaching Focus & Strategy	1. Write the following in exponential form (e.g., 100 = 102). a. 10,000 = _____ b. 1,000 = _____ c. 10 × 10 = _____ d. 100 × 100 = _____ e. 1,000,000 = _____ f. 1,000 × 1,000 = _____
Differentiation	Teacher will pair struggling students with a strong partner as well as reteaching concepts as needed.
Review & Revise (Teacher Reflection)	Exit Ticket to check for understanding . Write the following in exponential form and as a multiplication sentence using only 10 as a factor (e.g., 100 = 102 = 10 × 10). a. 1,000 = _____ = _____ b. 100 × 100 = _____ = _____
Resources & Materials	Engage NY Module

Decision 6: Acquisition Lesson #4

(Lesson plan necessary for student learning. You will have multiple Acquisition Lessons within a unit. Not all parts need to be filled in; use only those applicable.)

Unit Topic:

Standards:
Anchors:

Lesson Essential Question	How do you use exponents to denote powers of 10 with application to metric conversions.
Time (In Days)	1
Activating Thinking (Hook to motivate, link to prior knowledge)	T: (Project place value chart from millions to thousandths. Draw 3 disks in the tens place, 2 disks in the ones place, and 4 disks in the tenths place.) Say the value as a decimal. S: 32.4 (thirty-two and four tenths). T: Write the number on your personal boards and multiply it by 10. S: (Write 32.4 on their place value charts, cross out each digit, and shift the number one place value to the left to show 324.) T: Show 32.4 divided by 10. S: (Write 32.4 on their place value charts, cross out each digit, and shift the number one place value to the right to show 3.24.) Repeat the process and sequence for 32.4 × 100, 32.4 ÷ 100, 837 ÷ 1000, and 0.418 × 1000.
Acceleration/Previewing (Preview of key vocabulary, concepts, and skills prior to learning)	T: (Write 9 tenths on board.) Show this unit form as a decimal. S: 0.9 T: (Write 10 tenths on board.) S: 1.0 Repeat the process for 20 tenths, 30 tenths, 70 tenths, 9 hundredths, 10 hundredths, 11 hundredths, 17 hundredths, 57 hundredths, 42 hundredths, 9 thousandths, 10 thousandths, 20 thousandths, 60 thousandths, 64 thousandths, and 83 thousandths. Write in Exponential Form (3 minutes) Materials: (S) Personal white board Note: Reviewing this skill in isolation lays a foundation for students to apply it when multiplying during the lesson. T: (Write 100 = 10?.) Write 100 in exponential form. S: (Write 100 = 102.) Repeat the process for 1,000, 10,000, and 1,000,000. Convert Units (2 minutes) Use this quick fluency drill to activate prior knowledge of these familiar equivalents. T: (Write 1 km = ____ m.) Fill in the unknown number. S: (Write 1 km = 1,000 m.)

	Repeat process and procedure for 1 kg = ____ g, 1 liter = ____ mL, 1 m = ____ cm.
Teaching Activities and Strategies (Examples: Collaborative Pairs; Distributed Guided Practice; Distributed Summarizing; Graphic Organizers) Key Questions: Add throughout the lesson	Using a place value chart the teacher will model metric conversions. T: Here is a place value chart. (Show the place value chart from thousands to thousandths without other headings.) T: Here is a set of column headings based on metric length related to our place value chart, designating one meter as the base unit, or the ones place. T: Use your meter strip to show and explain to your partner the lengths that relate to the tenths, hundredths, and thousandths places. (Move through the tenths, hundredths, and thousandths until identifying and naming meter as 1 millimeter.) Have students then explain to their partner lengths that relate to the tens, hundreds, and thousands places. For example, 10 meters would be about the length of the classroom, 100 meters about the length of a football field, and 1,000 meters is a kilometer, which may be conceived in relation to the distance to their home from school.
Summarizing Strategies (Learners summarize and answer LEQ)	Rename or convert large units as smaller units using multiplication equations with exponents. T: (Draw and label a line 2 meters long on the board.) T: How many centimeters equal 2 meters? S: 200 centimeters. (Label the same 2 meter point as 200 centimeters. Fill in the first row of the t-chart.) T: Tell me a multiplication equation multiplying by 2 to get 200. S: 2 100 = 200. T: Restate the equation renaming 100 with an exponent. S: 2 102 = 200. T: With your partner, determine how many centimeters are equal to 1.37 meter. Use your meter strip if it helps you. S: It's 1 meter and 37 centimeters. □ It's more than 1 meter and less than 2 meters. □ 37 hundredths of a meter is 37 centimeters. 100 cm + 37 cm = 137 cm. T: What is the equivalent measure in

	centimeters? S: 137 centimeters. (On the board, label the same 1.37 meter point as 137 centimeters. Fill in the second row of the chart.) T: On your boards, show this conversion using a multiplication equation with an exponent. S: 1.37 100 = 137. □ 1.37 102 = 137. T: What must we do to the number of meters to rename them as centimeters? S: Multiply the number of meters by 100 or 102 . (Record the rule on the chart. Repeat with 2.6 meters.) T: How can we use multiplication to rename a meter as millimeters? Discuss with your partner. S: Multiply the number of meters by 1,000 or by 103 . T: Take a moment to write multiplication equations with exponents to find the number of millimeters to complete the third column of our chart. T: Show me your boards. S: (Show 2 103 = 2,000, 1.37 103 = 1,370, and 2.6 103 = 2,600.) T/S: (Fill in the equivalent millimeter measures together.) T: Explain the difference between A and B to your partner. Problem A Problem B 2 meters 103 = 2,000 meters 2 103 = 2,000 2 meters = 2,000 millimeters S: Problem A is not renaming or converting, but multiplying 2 meters by 103, so the answer is 2,000 meters. That's more than 2 miles! □ Problem B is renaming by multiplying 1,000 by 2 because each meter has a thousand millimeters in it. After we multiply, then we can name the unit. That is the exact same measurement as 2 meters. T: Yes, we are multiplying the number of meters by 103 . Explain why we multiply to rename large units as small units. (Point to the 2-meter line drawn on the board.) S: 1 meter = 1,000 millimeters, 2 meters = 2,000 millimeters. It's the number of meters that is being multiplied, not the meters. □ Multiplying didn't make 2 meters into more meters, but renamed the 2 meters as 2,000 millimeters. □ One meter got chopped up into 1,000 millimeters, so we multiply the number of meters by 1,000. □ The length stays the same because we're making more units by decomposing a meter, not by making more copies of a meter.
Extending/Refining Activities	Which of the following statements is false? Explain your thinking to your partner. a. 2 m 103 = 2,000 m b. 2 m 103 = 2,000 mm c. 2 103 = 2,000

	d. 2 m = 2,000 mm
Assignment and/or Assessment	Problem 2 Rename millimeters and centimeters as meters using division equations with exponents. Again, using the 2-meter line and chart, reverse Problem 1's sequence and convert from smaller to larger units, dividing by 102 to rename, or convert, centimeters as meters, dividing by 103 to rename, or convert, millimeters as meters. Culminate with the same reflection: T: We are dividing the number of meters by 102 or by 103 . That is a method for renaming centimeters as meters and millimeters as meters. Explain the difference between C and D with your partner. Problem C Problem D 2,000 mm ÷ 103 = 2 mm 2,000 ÷ 103 = 2 2,000 mm = 2 m
Re-Teaching Focus & Strategy	Problem 3 A ribbon measures 4.5 meters. Convert its length to centimeters. A wire measures 67 millimeters. Convert its length to meters. A ribbon measures 4.5 meters. Convert its length to centimeters. A wire measures 67 millimeters. Convert its length to meters.
Differentiation	Students who need extra support will only work on converting from larger units to small units first. Once they understand this concept, they will then learn to convert from smaller units to larger units.
Review & Revise (Teacher Reflection)	Exit Ticket for understanding How can we use what we know about renaming meters to millimeters to rename kilograms to grams and liters to milliliters?
Resources & Materials	Engage NY Module, Metric strips

Decision 7: Extending Thinking Lesson

(Lesson plan for extending thinking lesson involving higher level thinking skills. You would only have a few of these per unit.)

Unit Topic:

Standards:
Anchors:

Lesson Essential Question	How can I apply mathematical concepts learned to real life situations?
Time (Days)	5
Mini-Lesson (Quick lesson prior to activity.)	Students will be given a recipe and store circulars. Teacher will ensure items in the recipe are in the store circular. Students will calculate the total cost of the recipe. They will make predictions about which recipe will be the cheapest. They will then check their predictions.
Activity or Task (Details of activity.)	Title/Concept In the Chef's Kitchen Project Culminating Activity Essential Question Why does a chef need to know which menu items are the most popular? Paragraph Description Students will be asked to prepare a written report, poster or graph. Students will use the information on page 2 of their GO Math

	Textbooks to solve the word problem and represent their findings. Mini-Lesson (Quick lesson prior to activity.) The teacher will bring a recipe from home and "think aloud" to determine the amount of food needed to prepare the recipe for the whole class. The teacher would ask students if they needed to use multiplication or division. Extension: Bring in store circulars and have students calculate the total cost of the food items. Time (In Days) 7 Days Steps or Task Analysis (Details of activity.) 1. Students will read the opening sentences of In The Chef's Kitchen, along with the description of the project. 2. Students will be asked to describe the project in their own words. 3. Explain the Project Scoring Rubric located on page 2 of the TE. 4. Extra Credit/Extension students will calculate the total cost using store circulars. 5. Could we determine the cheapest store to purchase needed items?

Summarize/Share (Learners summarize and answer LEQ)	Students will present their projects clearly and completely.
Assignment and/or Assessment	
Differentiation	Students who need an additional challenge will be asked to complete a cost comparison analysis between two stores using circulars and the items needed in the recipe.
Revise/Review (Teacher Reflection)	Revise/Review Students who need additional scaffolding will have a graphic organizer to guide their thinking with the explicit math facts needed to solve the problem.
Resources & Materials	Store circulars, poster boards as needed, recipe cards

Copy this page as needed for additional assessments.

Decision 4: Student Assessments #1

**(How students will indicate learning and understanding of the concepts in the unit.
Note: Can have multiple assessments, one on each page.)**

Unit Topic:

Title	Assessments
Description	End Of Module Assessment- when Engage NY Module is completed.
Time (In Days)	
Differentiation	Assessment will be chunked for students as needed.
Revise/Review	
Resources & Materials	Engage NY Module