Title:	How is multiplying by 10 related to place value?
Grade Level: Content Area:	4 Math
Overview	In this lesson, students practice place value. Then, they will investigate how place value is connected to multiples of 10. Based upon their observations, students will solve problems related to place value.
Learning Objectives	Students will be able to understand that place value is connected to multiplying by 10. Students will be able to solve place value problems using a variety of strategies.
Movement goals	Through movement, students will practice place value terms. They will then use direct modeling to visualize place value by physically modeling the locations of the numbers in a place value table.
GLCEs	Students who demonstrate understanding can: **4-NBT-1.** **Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right.** [For example, recognize that 700÷70 = 10 by applying concepts of place value and division.] **4-NBT-2.** **Read and write multi-digit numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.**
Materials / Resources	• Projector • Place Value rap (suggested: "Place Value: Math at its Finest" by SHEPOLOGY (https://youtu.be/pRVw-9qQ7T4?t=4s) [lyrics attached below] • Number Sheets (masters attached below) • 36 pieces of colored paper (9 sheets of 4 different colors) • Student question sheet (sample attached below) • Place Value video (suggested: "Place Value Song for Kids | Ones, Tens, and Hundreds" by NUMBEROCK Math Songs (https://youtu.be/a4FXl4zb3E4) [lyrics attached below]
Teacher preparation (include spatial modifications as needed)	Open both place value videos and adjust volume. Make copies of lyrics for students and 10 copies of each Number Sheet. Furniture will need to be pushed to the sides of the room.

Lesson Sequence	**Introduction (hook, purpose setting, prior knowledge connection)**
Include description of grouping and pacing strategies. Students should be actively engaged in multiple ways.	*Review of place value terms* [6 minutes] As the first lesson of the year, this introductory activity will serve as a reminder of place value terms. Pass out lyric sheets. Play the Place Value rap (https://youtu.be/pRVw-9qQ7T4?t=4s) (2 minutes). During the first viewing, students should practice the words and observe the movements. Then, have students stand up and arrange then into groups of 5. The, students will perform the dance at least twice. Invite the students to sit on the floor. Based upon the video and their recollections from previous years, ask the students to define *place value*. After a summer off, the definition might be presented in small pieces by many students! Explain that today the students will investigate to answer the question: "How is multiplying by 10 related to place value?"
	Instruction, guided practice, activity, checks for understanding: Remind students that the most common ways of writing numbers in the world today uses only 10 different digits: the numbers 1-9, and 0. Write the 10 digits on the board. Have the students *turn-and-talk* with a partner: how is it possible to count to any number we can imagine if we only use 10 different symbols? Allow students to talk for about 30 seconds, then have a few pairs share their ideas. Write these ideas on the board or on chart paper, as you may find them useful to refer to later in the lesson or the unit. (*Ideas should include concepts such as: we rearrange the numbers in different ways to make bigger numbers and how incredibly inconvenient it would be if we had to remember a different symbol for every number!*) *Investigation into the utility of place value in base-ten* Let the students know that they will investigate one way that place value can be helpful. Make columns of colored paper extending from the board: each column should be a different color, made up of 9 separate pieces of paper. On the board itself, draw a place value table with four columns: ones, tens, hundreds, thousands. Hand copies of the "1" Number Sheet to ten different students. One-by-one, instruct each of the students to stand on one of the colored squares in the "ones" column. Have the class count as you add the students. When the 10th student tries to find a space, all of the colored squares in the "ones" column will be filled.

Ask the class what happens now? Hopefully, someone will point out the empty spaces in the tens column.

Mention that you are going to use your super powers to squish all 10 of the standing students into a ball, because the next column over only wants groups of 10. *Pretend to squish the students together, take all of their "1" Number Sheets, and squish those into a single "10" Number Sheet. Hand the new 10 to the student that did not have a spot, have that student take a spot in the 10s column, and have everyone else sit down.*

Point out that there is now only one student standing. How do we know this isn't just one student? How many tens are there? There is 1 ten (*write a 1 in the tens column on the board*). How many ones are there at the moment? (*zero, so write a 0 in the ones column on the board.*)

Hand out copies of the "10" Number Sheet to nine more students and again fill the column. Again, "squish" the students together to make 100.

Have students predict what will happen when you have ten 100s, and then repeat the process to create 1,000.

Distribute Number Sheets to all students who do not currently have them. Ask groups of students to stand and figure out how to represent various numbers by standing on the colored cards. When they think they have the correct arrangement, the class should count the number of 1s, 10s, 100s, and 1,000s in each column. Record the numbers on the board.

After a few examples, have students represent 1, 10, 100, then 1,000. Have the students *turn-and-talk* with a partner: what pattern did they notice? Allow students to talk for about 30 seconds, then have a few pairs share their ideas. *Make sure to include discussion both of the number of zeros and of the fact that while only one student is standing in each example, each student is not worth the same. In fact, **each student is worth 10 times as much as the student in the next spot over**.*

As a final example, have students represent the numbers 31 and then 301. Have the students *turn-and-talk* with a partner: what pattern do they notice? Allow students to talk for about 30 seconds, then have a few pairs share their ideas. *Make sure to again include the idea that the 3 students in the hundreds column are worth MUCH more, 10 times as much, as the students in the tens column. Also point out the importance of the number zero. In 301, although there are no tens, it is holding that empty space. Just think of the difference between $31 and $301: that little zero, which we usually think of as nothing, is actually very important!*

Allow students some time to work on the attached student sheet.

	Reflection demonstration of learning and sharing out: Allow students to share their answers and their strategies for the three questions on the student sheet. Alternate strategies are encouraged! Create a class consensus answer to the question: "How is multiplying by 10 related to place value?" To conclude, pass out lyrics to the song "Place Value Song for Kids | Ones, Tens, and Hundreds" by NUMBEROCK Math Songs (4 minutes): (https://youtu.be/a4FXl4zb3E4). Lead students in movements (marching, lunges, stretching) to the beat of the song.
Extensions	**Other Representations:** Students may enjoy learning how to represent numbers using systems other than Hindu-Arabic numerals and base-ten. One example would be to learn the notation and rules for writing **Roman numerals**: https://www.mathsisfun.com/roman-numerals.html Those interested in computer science might be interested in how numbers are represented in **binary**, the system of 1s and 0s that forms the basis for all digital devices: https://www.mathsisfun.com/binary-number-system.html
Assessment	Completed student sheets can serve as a formative assessment for this lesson.
Special education modifications or accommodations	• Allow for different types of movement. • Allow students to complete the student sheet in pairs or small groups. • For students that still struggle with counting by 10s, they might enjoy practicing with this surreal video that is more appropriate for a 4th grader than most of the material on YouTube: "The Counting by Tens Song" by Scratch Garden (https://youtu.be/Ftati8iGQcs) (2 minutes)

How is multiplying by 10 related to place value?

1) Serenity has 30 comic books in her collection. Serenity's dad has 10 times as many comic books as Serenity. How many comic books does Serenity's dad have? Use numbers or words to explain how you got your answer.

2) Janelle saved $800. Her older sister has 10 times as much money. How much money does Janelle's sister have? Use numbers or words to explain how you got your answer.

3) Tam is 9 years old. Tam's grandfather is 90 years old. Tam's grandfather is how many times as old as Tam?

<u>Lyrics</u>: Place Value

Talking about place value (place value)
Talking about place value (place value)
Talking about place value (place value)
Talking about place value (place value)
Talking about place value (place value)
Talking about place value (place value)
Talking about place value (place value)
Talking about place value (place value)

We got the **ones**, the **tens**, the **hundreds** too,
We got the **thousands**, the **ten thousands**, the **hundred thousands** too,
We got the **millions**, the **ten millions**, the **hundred millions** too,
Place value keeps on rolling and so should you!

We got the **ones**, the **tens**, the **hundreds** too,
We got the **thousands**, the **ten thousands**, the **hundred thousands** too,
We got the **millions**, the **ten millions**, the **hundred millions** too,
Place value keeps on rolling and so should you!

We got the **ones**, the **tens**, the **hundreds** too,
We got the **thousands**, the **ten thousands**, the **hundred thousands** too,
We got the **millions**, the **ten millions**, the **hundred millions** too,
Place value keeps on rolling and so should you!

Now we can whip, aye!
Now we can nae nae, aye!
Now we can whip, aye!
Now we can nae nae, aye!
Now drop, aye!
Now drop, aye!
Now hit the quan, yo!
Now hit the quan, yo!
Now hit the quan, yo!

We got the **ones**, the **tens**, the **hundreds** too,
We got the **thousands**, the **ten thousands**, the **hundred thousands** too,
We got the **millions**, the **ten millions**, the **hundred millions** too,
Place value keeps on rolling and so should you!

Lyrics: Place Value Song for Kids | Ones, Tens, and Hundreds

Picking pears, I got 1, 2, 3, 4, 5, 6, 7, 8, 9;
that's all that fit inside the ones place value line.
So I picked another pear and made a group of ten.
They fit into a bag perfectly even.
20, 30, 40, 50, 60, 70, 80, 90:
I had to keep picking pears - a hunger I had to feed -
so I picked another ten and that led
to one group of one hundred.
(A pear bonked me on the head and I said...)

Ten ones make ten.
Ten groups of ten are one hundred.
Ten hundreds make one thousand;
the pattern never ends.

I rode my bike one whole mile,
then 2, 3, 4, 5, 6, 7, 8, 9, and in a little while,
another mile made one group of ten.
A little voice inside my head said,
"Keep going I know you can!"
20, 30, 40, 50, 60, 70, 80, 90:
I never knew I had so many miles inside me!
The end of my trip was coming up ahead;
I rode ten more miles and reached one hundred.
(Then that little voice inside my head said...)

Ten ones make ten.
Ten groups of ten are one hundred.
Ten hundreds make one thousand;
the pattern never ends.

After the bell rang at eight o'clock,
I started playing with my base-ten blocks.
I stacked up nine and then one more made ten,
and then ten tens equaled one hundred.
200, 300, 400, 500, 600, 700, 800, 900:
another hundred wouldn't fit in the hundred's space...
I had to write one group in the thousands' place!
(And then I played the air bass.)

Ten ones make ten.
Ten groups of ten are one hundred.
Ten hundreds make one thousand;
the pattern never ends.

Ten ones make ten.
Ten groups of ten are one hundred.
Ten hundreds make one thousand;
the pattern never ends.

Ten groups of one thousand equal ten thousand.
Ten ten thousands make one hundred thousand.
And ten of those make one million,
and the pattern has no end.