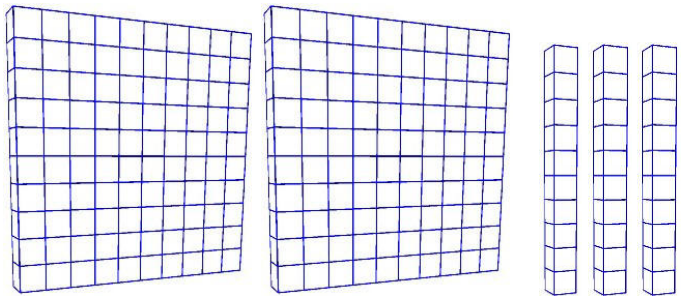
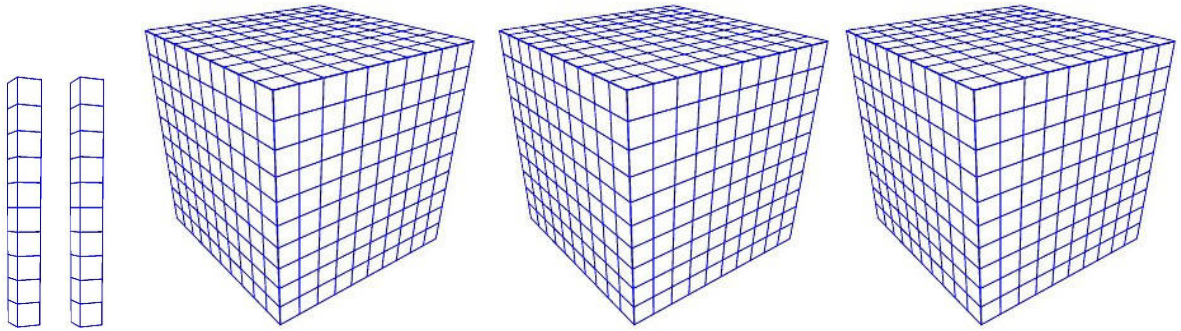
Task: Tree House Windows **5th Grade**

Tom and Gina are thinking about the number 2.3 mils, which represents the thickness of the plastic sheeting used to cover windows of their tree house to keep out the wind in the winter. The teacher asks each of them to create a representation of the number 2.3 using place value blocks.

Tom chose a flat for his unit and represented 2.3 with two flats and 3 rods.

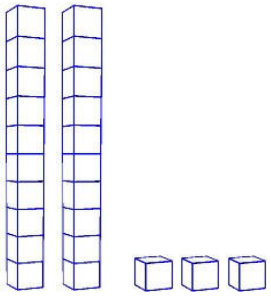


Gina chose a cube for her unit and represented 2.3 with two rods and 3 cubes.



a. Which do you think is the better representation for the number 2.3? Explain your reasoning.
b. Consider the representation you did not choose for part a. Explain why you don't think it is the best representation.
c. Create and draw your own representation of the number 2.3 using a rod for your unit. Explain why this representation is also appropriate.

Teacher Notes:	
If students do not include place value and the relationship between and among blocks in their explanations, teacher should guide students to include this level of detail. As a means of differentiation, you could change Gina's representation to 2 flats and 3 cubes because this requires only one level of place-value explanation, as opposed to the problem as written, which requires two levels of place value explanation. Any block can be chosen to represent the unit as long as there is a block that is smaller than it by 1/10 to represent the 0.3.	
Common Core State Standards for Mathematical Content	**Common Core State Standards for Mathematical Practice**
5.NBT.A.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.*	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.
Essential Understandings	
• **The concept of unit is fundamental to the interpretation of rational numbers.** • **One interpretation of a rational number is a part-whole relationship.** • **A rational number can be expressed as a decimal.**	
Explore Phase	
Possible Solution Paths	**Assessing and Advancing Questions**
a. Tom's representation is better because he uses a flat as the unit and a rod as a tenth of a unit. These two blocks have the appropriate relationship. The number 2.3 has 2 whole units so he uses 2 flats to represent them. The 0.3 represents 3/10 of a unit and a rod is 1/10 of a flat so the rod is the appropriate block to choose to represent the tenths place digit. b. Gina's representation is not the best because she uses a cube for the unit and uses rods with the cube. The number should include 2 units and 3 blocks that are 1/10 of that unit. However, a rod is 1/100 of a cube so these two blocks do not have the appropriate relationship to each other. OR Gina's representation is not the best because in choosing the cube as her unit, she represented 3 wholes and two hundredths rather than 2 wholes and 3 tenths. She could	Assessing (a): • Why do you think one representation is better than the other? • Which digit has the larger place value? • Should you use the larger or the smaller block to represent the larger place value? • How many place-value positions are there between 2 and 0.3? • Knowing that, how should you choose the two sizes of blocks to represent these digits? Advancing (a): • Could you use a different block than either the flat or the cube to represent the whole unit? • If so, which block would you use for your tenths and why? • How can you represent the place value of each digit using expanded notation with powers of 10? • How does this expanded notation relate the size of the blocks you used to model the number 2.3?

have used 2 cubes and 3 flats to represent 2.3 appropriately with the cube as her unit. c.  Since the rod is my unit, I need 2 of them to represent the 2 wholes in the number 2.3. Now I need 3 singles to represent the 0.3 because 0.3 represents 3/10 of a whole and a single is 1/10 of a rod.	Assessing (b): • Can the number 2.3 be represented using the flat as the unit? If so, which block should represent the tenths and why? • If not, why not? • Can the number 2.3 be represented using the cube as the unit? If so, which block should represent the tenths and why? • If not, why not? • In terms of place-value, how is the flat related to the rod? • In terms of place-value, how is the cube related to the rod? • Which block should be used to represent the larger place value and why? Advancing (b): • Use expanded form with powers of 10 to write the number represented by 3 cubes and 2 rods. • Explain, using the relative sizes of the blocks, why each block represents a particular place-value. Assessing (c): • Why did you choose that block to represent the tenths, if the rod represents the unit? Advancing (c): • Is there another block you could use to represent the unit? If so, why and which block would you need to use to represent the tenths and why?
Possible Student Misconceptions	
Students may confuse which place value blocks are 10 times larger or smaller than others.	What place value does the digit 2 in the number 2.3 represent? What place value does the 3 represent in the number 2.3? Is the place value for 0.3 larger or smaller than the place value for the 2? Which block should be larger, the one used to represent the whole or the one used to represent the tenth?
Students may choose Gina's representation over Tom's.	What did Gina choose for her unit? How many units should there be in the representation of 2.3? How many blocks unit blocks did Gina choose to represent her units?
Students may choose something other than a single to represent a tenth of a rod.	Is the place value block you chose for the tenth, larger or smaller than the rod? Which should be larger, the block that represents the unit or the one that represents the tenth of a unit?
Entry/Extensions	**Assessing and Advancing Questions**

If students can't get started….	Assessing: • If a flat represents a whole unit, what place values are represented by the other blocks? • If a cube represents a whole unit, what place values are represented by the other blocks? Advancing: • Should the block used to represent a tenth be smaller or larger than the block used to represent a whole unit? • How many different representations of 2.3 can you create using place value blocks?
If students finish early….	Assessing: • Using the cube as a unit, how would you represent the number 12? • Using a flat as a unit, how would you represent the number 4.2? Advancing: • How many different ways can you use place value blocks to represent 2.03. • How many different ways can you use place value blocks to represent 2.003? • Are there more or fewer ways to represent 2.003 than there are to represent 2.03 and why is that? • Is it possible to use place value blocks to model the number .023? If so, explain how. If not, explain why not.

Discuss/Analyze

Whole Group Questions

Key Understandings:

- Place value blocks are appropriate for modeling numbers because the single is 1/10 of a rod; a rod is 1/10 of a flat; a flat is 1/10 of a cube.
- Because of this relationship, different blocks can be chosen to represent a particular place value.

Questions:

- In the number 2.3, what can you say about the place value of the 2 in relation to the place value of the 3?
- Can you make a general statement describing the relationship between any digit in the whole unit place and the digit immediately to its right? What can you say about a number in the tenths place and the value of the digit immediately to its left?