TASK 6

Name_____Date_____

Meter Reader 1

Officer Smith is checking the amount of money in the meters for various parking spaces around the city. Each meter charges different amounts of money for each hour used.

Part A:

Decide when each meter will run out of time. Draw diagrams and use equations or words to show and justify your reasoning for each situation:

1. Meter A charges $0.60 per hour. There is $3.00 in the meter.

2. Meter B charges $0.50 per hour. There is $9.00 in the meter.

(Part A continued)

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3. Meter C charges $0.80 per hour. There is $4.00 in the meter.

4. Meter D charges $0.30 per hour. There is $3.00 in the meter.

Describe in words the patterns you notice between the meter charge, the amount of money in the meter, and the time until the meter runs out.

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Part B:

It is a holiday weekend and the city has lowered meter parking prices. Predict when each meter will run out of time. Then calculate when each meter will run out. Draw diagrams and use equations or words to show and justify your reasoning for each situation.

5. Meter A charges $0.06 per hour. There is $3.00 in the meter.

6. Meter B charges $0.05 per hour. There is $9.00 in the meter.

(Part B continued)

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7. Meter C charges $0.08 per hour. There is $4.00 in the meter.

8. Meter D charges $0.03 per hour. There is $3.00 in the meter.

Describe in words the patterns you notice in meter charge, the amount of money in the meter, and the time until the meter runs out in problems 5, 6, 7, and 8. What can you say is true about all of the quotients in relationship to the divisors and dividends?

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Meter Reader 1

Why this lesson now?

Students construct understanding of dividing various whole number values by decimal values through the hundredths. They extend the notion that when one divides by a decimal less than one, the result is a quantity larger than the dividend. This is done by working with division situations with decimal values involving multiples of 0.10 or 0.01 and noting the size of the corresponding quotients. Measurement division problems using money gives a context to develop the conceptualization of decimal division as being similar to that of whole numbers.

Task 6: Meter Reader 1

Officer Smith is checking the amount of money in the meters for various...

See student task sheet for the complete task.

Mathematical Content Standards	5.NBT.B.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.
Mathematical Practice Standards	MP1 Make sense of problems and persevere in solving them. MP2 Reason abstractly and quantitatively. MP4 Model with mathematics. MP5 Use appropriate tools strategically. MP7 Look for and make use of structure.	
Essential Understandings (EUs)	• When dividing by a decimal number less than one, the quotient will be more than the dividend because either: - you are making groups of an amount less than one; or - you are making less than one group.	
Materials Needed	• Student reproducible task sheet	

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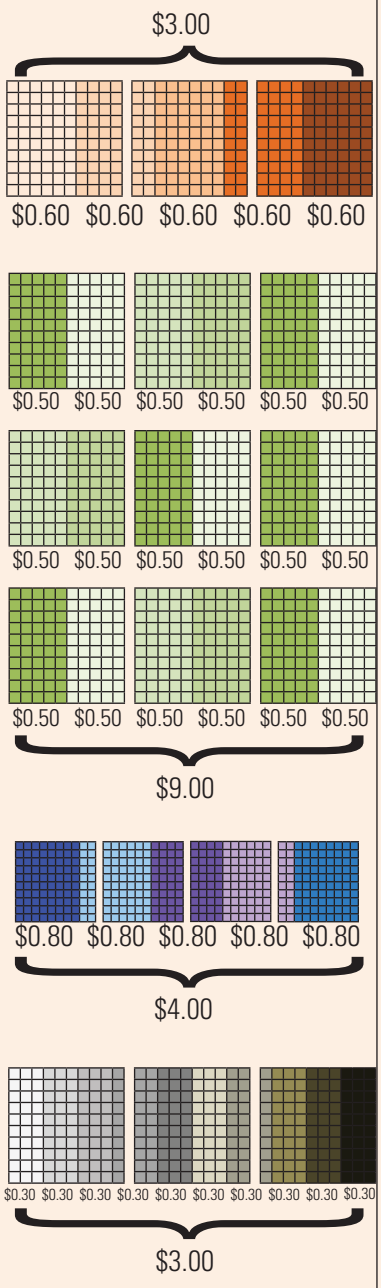
SET-UP PHASE

Someone please read the task aloud. Here are some decimal squares. There are some on each table that you may use to help with your thinking. Someone tell us about how parking meters work. Where do you see them? Work on the problem by yourself for five minutes before working with your partner.

EXPLORE PHASE

Possible Student Pathways	Assessing Questions	Advancing Questions
Uses a diagram.  (Similar strategies for hundredths situations.)	What does your diagram represent? How many (groups of 0.60, 0.50, 0.80, 0.30) are in (3, 9, 4, 3)? How many groups of (0.06, 0.05, 0.08, 0.03) are in (3, 9, 4, 3)?	If you know how many groups of (0.60, 0.50, 0.80, 0.30, 0.06, 0.05, 0.08, 0.03) are in (3, 9, 4, 3), how can you determine how long until each meter runs out?

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Possible Student Pathways	Assessing Questions	Advancing Questions
Uses a numeric strategy. Student thinks of how many 0.60's are in 3.00. 0.60, 1.20 1.80, 2.40, 3.00. That's 5 times. So 5 hours. Student thinks of how many 0.50's are in 9.00. 0.50, 1.00, 1.50, 2.00, 2.50, 3.00…9.00. That's 18 times. So 18 hours. Student thinks of how many 0.80's are in 4.00. 0.80, 1.60, 2.40, 3.20, 4.00. That's 5 times. So 5 hours. Student thinks of how many 0.30's are in 3.00. 0.30, 0.60, 0.90, 1.20, 1.50, 1.80, 2.10, 2.40, 2.70, 3.00. That's 10 times. So 10 hours. (Similar strategies for hundredths situations.)	What does each number represent? Why did you count by (0.60's, 0.50's, 0.80's, 0.30's)? How did you know when to stop counting?	How can you use the values and pattern in your strategy to write an equation?
Uses equations. $3.00 ÷ $0.60 = 5 (or $0.60 x ☐ = $3.00) $9.00 ÷ $0.50 = 18 (or $0.50 x ☐ = $9.00) $4.00 ÷ $0.80 = 5 (or $0.80 x ☐ = $4.00) $3.00 ÷ $0.30 = 10 (or $0.30 x ☐ = $3.00) $3.00 ÷ $0.06 = 50 (or $0.06 x ☐ = $3.00) $9.00 ÷ $0.05 = 180 (or $0.05 x ☐ = $9.00) $4.00 ÷ $0.08 = 50 (or $0.08 x ☐ = $4.00) $3.00 ÷ $0.03 = 100 (or $0.03 x ☐ = $3.00)	What does each number in your equations represent? Why did you write an equation with (division, multiplication) to represent the situation?	(If written as multiplication) How can you write this equation with division to represent the situation? (If written as division) How can you write this equation with multiplication to represent the situation?

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SHARE, DISCUSS, AND ANALYZE PHASE

EU: When dividing by a decimal number less than one, the quotient will be more than the dividend because either:

- **you are making groups of an amount less than one; or**
- **you are making less than one group.**

- How did you represent this problem with a diagram? *(We showed 3 wholes and found the number of times 0.6 fit inside that and the answer was 5 times.)*
- Who can come up and say what each of the numbers represents in this diagram? *(The 3 is three dollars, the 0.6 is 60 cents per hour, and the 5 is 5 hours.)*
- How did you use these representations to reason about how long it would be before each meter ran out? *(We knew that because each hour was less than one dollar, the number of hours would be more than 3.)*
- So because you were finding groups of less than one, the answer had to be larger than the number of dollars you had. **(Revoicing)**
- Can the group that added 0.6 repeatedly or used multiplication come up and explain your strategy? *(We thought about how many groups of 0.60 fit inside of 3 dollars so we added 0.6 until we came to 3; we multiplied 0.6 x ____ = 3.)*
- So this problem can be solved using addition or multiplication. Were there any other operations? *(We used division.)*
- How does division represent this situation? *(Because we are dividing 3 into groups of 0.6.)*
- So when we know the whole and know the equal groups, we can use division. **(Revoicing)**
- How is reasoning about how many 0.60 are in 3.00 the same and different as asking how many six-tenths are in 30 tenths? **(Challenging)**
- Other groups thought about each situation as whole number division (e.g., $3.00 divided by $0.60 as 300 divided by 60). How does this strategy help you to think about the division in each situation? *(With multiplying by decimals, we can divide without the decimals and then put them back in.)*
- How is $3.00 divided into groups of $0.60 the same as $300 divided into groups of $60? How is it different? How do the results of each situation compare? **(Challenging)**
- What did you notice about the number of hours each meter would last in each situation? How does this compare to the hourly cost of each meter? *(The number of hours is always greater than the total dollars because each hour costs less than one dollar.)*
- When we divide by a number less than one, our quotient will be larger than the dividend. **(Recapping)**

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Application	There are additional meters across from city hall that cost more per hour than the ones we have talked about. These meters cost $0.90 per hour. If there is currently $2.70 in the meter, how long until the meter runs out? What if someone put another $1.80 in the meter?
Summary	In your own words, summarize two ideas you discovered from today's lesson. How do these ideas relate to what we learned in the Cooking Measures task?
Quick Write	When dividing by a decimal number that is between 0 and 1, why is the quotient more than the dividend? Use the equations below to respond to the question. $3.00 ÷ $0.60 = 5 $3.00 ÷ $0.06 = 50 $3.00 ÷ $0.30 = 10

English Learner Support:

1. Slow down discussions for students who are English learners by asking other students to repeat ideas, and to put ideas in their own words.
2. Publically list strategies used by students for figuring out how to solve the problems. Ask students to set a goal to use more than one strategy.