Lesson 2 Teacher Notes

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Standards	
Content Standard: 7.RP.3 Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.*	Standards for Mathematical Practice: Making sense of problems and persevere in solving them. Construct viable arguments Model with mathematics Use appropriate tools strategically Look for and make use of structure

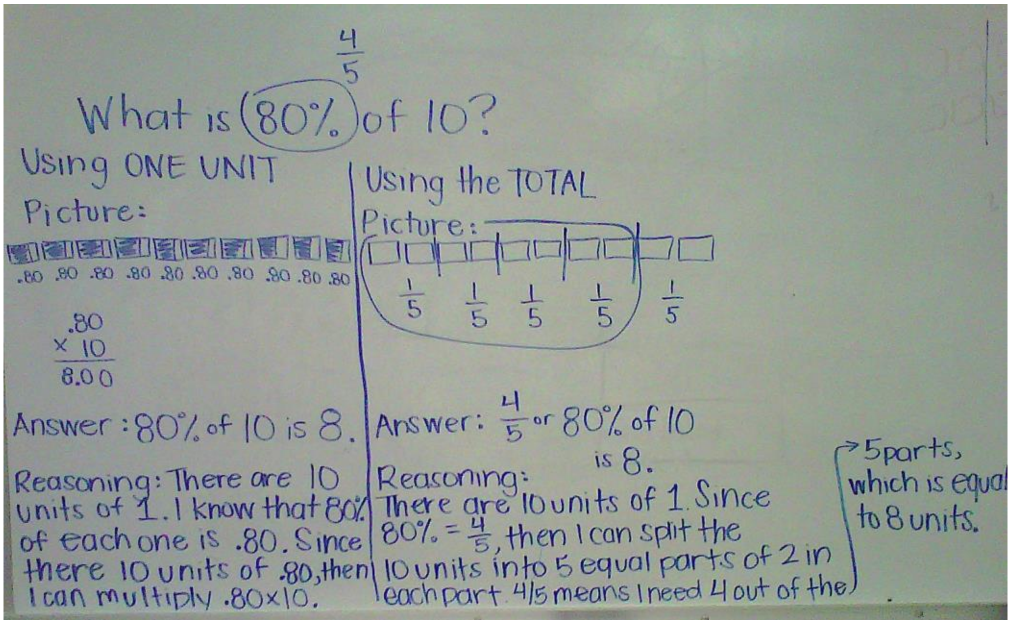
Student Actions	
Learning Objective: Students will be able to find a percent part of a quantity by finding the percent of the whole/total by breaking the whole/total into parts.	Task: Students will draw a picture of a quantity broken into unit ones, and find the percentage of the whole/total. Students will then describe the reasoning for their picture, work, and answer.

For the Teacher	
Rationale Prior Knowledge Required: This lesson relies on student mastery of common percent to fraction conversions. The fractions students need to know conversions for are 10%, 20%, 25%, 30%, 40%, 50%, 60%, 70%, 75%, 80%, 90%. Students will use the most reduced fractions for each of these conversions (i.e. Use 2/5 instead of 4/10.) This lesson relies on student understanding that when you take a fraction of a whole, the parts must be even. This lesson relies on student understanding that ¾ means ¼ + ¼ + ¼, just as 5/6 means 1/6 + 1/6 + 1/6 + 1/6 + 1/6. As necessary for Lesson 1, this lesson continues to rely on the same skills mentioned in Lesson 1's Prior Knowledge Required. Goals for this lesson: Similar to Lesson 1, students can understand the concept of finding the percent of a quantity by breaking the quantity into units of 1. Then, students will find the part of the whole/total.	Student Misconceptions:

Ex of Lesson 1 versus Lesson 2 25% of 8 — 25% of 8 1 1 1 1 1 1 1 1 — 1 1 1 1 1 1 1 1 [use little unit boxes here] 0.25 + 0.25 + 0.25 + 0.25 + 0.25 + 0.25 + 0.25 + 0.25 — 25% = ¼ Break the 1's into 4 groups & circle one of the groups Adding up all the pieces gives us $2.00. — 1 1 1 1 1 1 1 1 <u>Key questions for students to write about might include:</u> • How are you going to draw the picture? • We are using a side-by-side delivery model [as shown above], which contrasts two different strategies • Even though the strategies are different, focus on the answers being the same; What we are doing is two different approaches & two different ways of looking at the same problem *Note:* Detailed examples and teacher explanations are listed below in the "Lesson Description & Instruction Delivery" section <u>Differentiation:</u> <u>Materials:</u> • Included in this lesson are 4 documents that teacher should have as posters or written on whiteboard for teacher & students to reference • 40 quarters	

Lesson Description and Instructional Delivery

Example of Side-by-Side that we will model throughout this lesson:



SLIDE 1: Title of Lesson

SLIDE 2: Warm-Up: The focus of the Warm-Up is for students to recall with fluency the most reduced fraction equivalencies of common percentages.

How do we check for understanding on the Warm-Up?

- Student who don't reduce completely (i.e. saying "4/10" instead of "2/5", teacher should reference bar models asking, "Where do you see 40%?" Student will probably say that they see it in 4 groups of 10%, and teacher can ask, "Is there anywhere else you see 40%?" If student doesn't, teacher can get another student to explain that they see it in 2 groups of 20%, which is equivalent to 40%, which is also equivalent to 2/5.
- As mentioned above, teacher should reference already-made bar models (either on posters or whiteboard) while going over conversions

SLIDE 3: Think-Pair-Share

This is not in the Student Notes. This is an opportunity for students to discuss a problem, such as "What is ___% of $____?" given a 100 grid with part shaded, and students must fill in the blanks to complete the question. (Correct answer is _25_% of _1_.) This is designed for students to connect the part that is shaded, compared to the whole.

SLIDE 4: Think-Pair-Share

This is not in the Student Notes. Question asks, "What is ___% of $___?" (Correct answer is _30_% of $_4_.) The difference between this slide and the previous slide is that this one has 4 100 grids, and the previous slide only had 1.

After students figure out the correct answer & teacher has checked for understanding, the slide show has 1 of the 100 grid disappear. Teacher asks, "How does this change the problem?" and lets students think and then discuss it with their partner. Students should be able to explain that it changes to the question to: "What is _30_% of _3_?" instead of 30% of 4.

SLIDE 5: "Let's Look at What we Did Yesterday":

This example should be teacher-directed & is a review of what was learned the previous class. Teacher can call on a student to read the problem or students can read the problem with their partner.

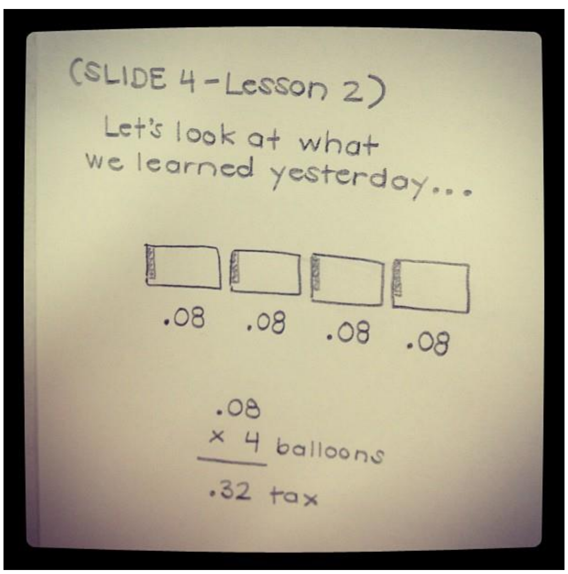
Problem: Let's say you walk into the Dollar Store and find four balloons for $1 each. You think you would pay $4 total, but remember that tax is 8% of the total price. What will 8% of $4.00 be?

Teacher asks: "What is the total amount of money you see in this problem?"
Student(s) reply that $4 is the total amount.
Teacher: "How can we draw $4?" Student says to draw 4 units or 4 rectangles. Teacher can follow that up by asking how much money each unit (or rectangle) represents.

Teacher: "What does 8% mean?"
Student(s): We want them to say it means 8 out of 100 pieces.
Teacher: "Let's visualize what 8 out of 100 looks like."

Teacher can say, just to emphasize how we are taking 8% of each piece: "8% of that [teacher pointing to each unit one by one] is .08, 8% of that is .08, etc." to get students to understand that we're adding .08 four times or multiplying .08 by 4.

Model with a picture:



Write an explanation of how you got your answer:

A desired explanation could be:
There are $4 so there are 4 units of $1. I know that 8% of each one is 0.08. Since there are 4 units of 0.08, then I can add 0.08 four times or multiply 0.08 by 4 to get $0.32.

<u>SLIDE 6: Anticipatory Set</u> ***(Pencils down, students should not be writing anything during this time.)***

[Anticipatory Set: Get 8 students up in front of the class & hand them each 4 quarters. Show what it would look like (or ask another student to take) 50% of *each* students' money, versus finding 50% of the *total* amount.]

This is a blank slide with teacher instructing what to do.

Directions for Teacher:

1. Ask for 8 volunteers or choose 8 students to come to the front of the room.
2. Give each student that comes up 4 quarters.

Teacher asks: "How much money does each person have?"
"How much total money do these 8 people have?"
"I need to take 50% of the money that's up here. We're going to look at two different ways to do this. How can I get 50% of the money up here?

- There are 2 different ways we can take 50% of all the money represented by the 8 students. Students can generate solutions to provide the teacher, but the two strategies are listed below. The teacher should act out both the strategies. If a student suggests the second strategy first, then the teacher can do that strategy first. Then the teacher can say, "Is there a second way I could take 50% of the money?" It doesn't matter the order of the two strategies. What matters is that both strategies are represented.

We think that students might say to take the money from the first 4 students or something similar (Strategy 2). If they say this, teacher asks, "Why are you taking money from the first *four* people?" to get them to explain that 4 is 50%, or half, of 8.

Strategy 1: A desired student response would be to tell the teacher that they can take $0.50 from each student. If a student says this, teacher can ask, "Why should I take $0.50 from each person?" to get students to say that half a dollar is $0.50.

If teacher does not get desired response, they can ask, "What would 50% look like if I was talking about this one student [pointing to only one student]?" Get students to say you would need to take half of their money, which is $0.50.

Strategy 2: The second strategy is to take all of the first four students' money. As mentioned previously, students might come up with this strategy first.

<u>SLIDE 7: WE DO: Example 1 – What number is 25% of 8?</u> *(Pencils back up, students doing the work in their notes)*

Comparing the UNIT model versus the WHOLE model.

Using the UNIT:
What number is 25% of 8? Doing a side-by-side of doing it by finding the percentage of UNIT versus the TOTAL

Teacher: "How many units do we have?" [Student think time.] "Show me on your fingers how many units we have." [Students show 8 on their fingers.]

"Take your pencil and put it on the first unit. [Wait & watch that students do that.] "How much is 25% of the first unit?" Give students think time, then have them tell their partner.

If students have trouble knowing that 25% is "twenty five hundredths," we can remind them how 25% means 25 out of 100, so we *could* break each unit into 100 pieces. "Do I really want to do that??" NO! 25 out of 100 means 0.25. Label this under the first unit.

0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25

"Remember that I'm finding 25% of 1, 8 different times." → This would be a good point to emphasize from the beginning of teaching them to do this.

"How much do I have altogether?" Students will say 2. "How did you get this?" Some students might say they added up 0.25 8 times, or others will say they multiplied by 8.

Using the TOTAL:

Key for teacher: Draw out 8 units, the picture has to stay the same to show the connection and similarity.

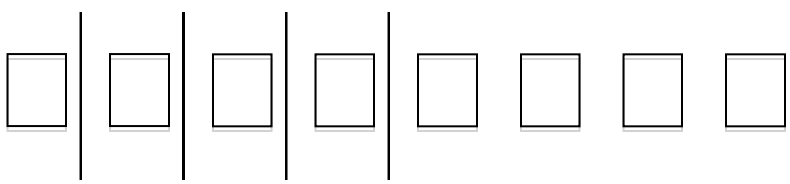
Instead of thinking of 25% as 0.25, we can use our memorized fractions to break the WHOLE into a number of parts. This is fractional thinking.

"Previously we described 25% as 0.25. Do we know another way to write 25%?"

Students respond that ¼ is another way to write 25%. "When we say ¼, what does that mean?" Desired response:

One fourth means to take the amount and break it into four parts and take one of those parts.

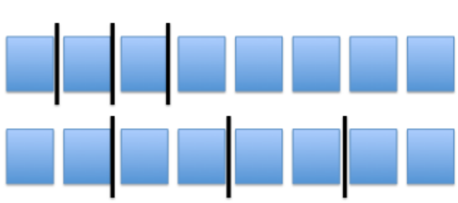
"Today we will find ¼ of 8."



"I have to find ¼ of 8. What do we do first?" Students: Break it into 4 parts.

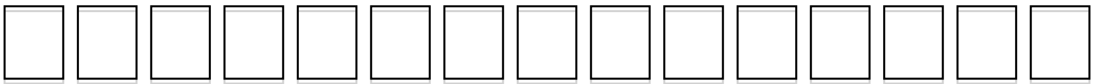
Error Analysis: To show some common mistakes, teacher can break the 8 units into 4 groups, but uneven groups. (Groups of 1, 1, 1, 5.) Teacher: "What is wrong with this, I broke it up into 4 groups like you told me to. What has to be true about my groups?" Get students to say that the groups have to be ***equal***.

Maybe their should be some type of reference on the wall stating that fractions require us to split into equal amounts.



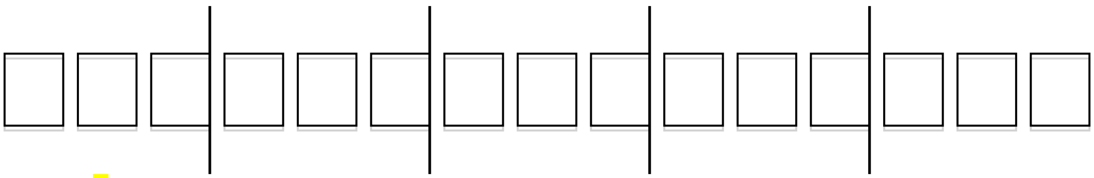
Common mistake students will make: Students will draw 4 lines, creating 5 groups. We want to avoid asking questions about how many *lines* to draw, focus on how many *groups* there should be.

<u>SLIDE 8: YOU DO: Example 2 – What number is 20% of 15?</u>



0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2

0.2 x 15 = 3



3 3 3 3 3

<u>SLIDE 9: Example 3 – What number is 75% of 12?</u>

Note to Teacher: These next 2 problems are a separate scaffold. The previous 2 examples were fractions with "1" in the numerator (1/4 and 1/5). The next two examples have numerators other than "1".

Using the UNIT Model
75% of 12

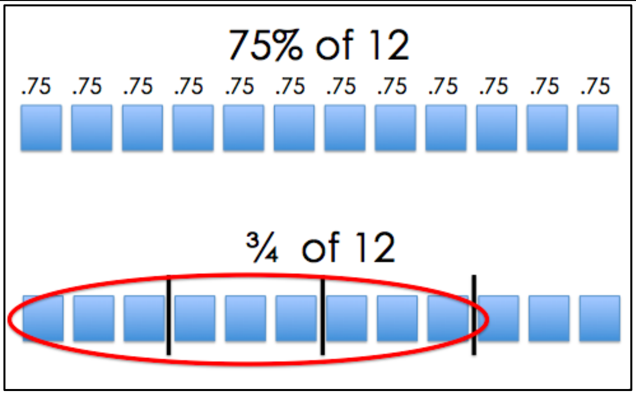
Using the WHOLE Model

¾ of 12

After drawing out 12 units, ask students "How many groups do we need to split it into." Students should pretty easily know that we split them into 4 groups.

Teacher: "How many are in each group?" Student says 3. "How did you know that there are 3 in each group, did you use trial & error, did you have a strategy?" Get student to explain (to class or to a partner) how they knew. This will be helpful for bigger numbers, such as splitting 40 into 4 groups, all students need to know how to do that effectively.

After breaking up the 12 into 4 groups of 3, circle 3 groups of 3



Misconceptions: We predict that some students might think the "3" in the numerator is the number of units in each of the four groups. This is just a coincidence in this problem. Point this out to students so that they don't form a wrong idea in their head that they start applying to other problems.

<u>SLIDE 10: YOU DO: Example 4 – What number is 80% of 10?</u>

Students do this independently or with a partner.

Misconceptions: Students might use 8% instead of 80%; might take 1/5 of the whole instead of 4/5

*Teacher note: Some students might use 8/10 instead of fully reducing it, and that is okay because obviously they will get the same answer, and in later lessons we will have explicit discussions about when it's easier to reduce, when it matters and when it doesn't.

<u>SLIDE 11: TICKET-OUT-THE-DOOR – 70% of 20</u>

Side-by-side like all the examples in this lesson have been

1) Which of the two methods do you think is easier?

2) Explain in detail why you chose that method.

Lesson 2 Student Notes

Lesson 2 Objective: Today I will be able to ________________________________

____

Let's look at what we learned yesterday…

Let's say you walk into the Dollar Store and find four balloons for $1 each. You think you would pay $4 total, but remember that tax is 8% of the total price. What will 8% of $4.00 be? Model with a picture: Write an explanation of how you got your answer:

Today, we'll look at another way of finding a percent of a number.

[Anticipatory Set: Get 8 students up in front of the class & hand them each 4 quarters. Show (possibly with another student) what it would look like to take 50% of *each* students' money, versus finding 50% of the *total* amount.]

Find 50% of 8 by finding 50% of EACH UNIT.	Find 50% of 8 by finding 50% of the TOTAL.
What is 50% of 8? ________ Describe your reasoning.	Is the answer the same? _________ Describe your reasoning.

Example 1: What number is 25% of 8?	
Using ONE UNIT Picture: Answer: Reasoning:	Using the TOTAL Picture: Answer: Reasoning:

Try It!

Example 2: What number is 20% of 15?	
Using ONE UNIT Picture: Answer: Reasoning:	Using the TOTAL Picture: Answer: Reasoning:

Let's look at a couple more…

Example 3: What number is 75% of 12?	
Using ONE UNIT Picture: Answer: Reasoning:	Using the TOTAL Picture: Answer: Reasoning:

Example 4: What number is 80% of 10?	
Using ONE UNIT Picture: Answer: Reasoning:	Using the TOTAL Picture: Answer: Reasoning:

Name: ______________________________________ Period: _______

Ratios and Proportions: Lesson 2 Ticket out the Door

What number is 70% of 20?	
Using ONE UNIT **Picture:** **Answer:** **Reasoning:**	**Using the TOTAL** **Picture:** **Answer:** **Reasoning:**

1) Which of the two methods do you think was easier?

2) Explain in detail why you chose that method.