Fractions as Division (Grade 5)

TEACHER: Let's keep going. And let's talk about a little bit more of a connection to what we did yesterday in class, which was our practice of fractions as division. So let's look at the next piece, fraction as division. So we're talking about what it looks like when we-- oops-- what it looks like when we divide based on what a fraction is.

I'm going to write a number. And you're going to write a complete number sentence for it. OK. So I'm going to tell you, 1 divided by 3-- let me erase this-- sorry-- 1 divided by 3. That is an incomplete number sentence.

That is an incomplete number sentence. I would like you to be able to tell me what is the dividend? What is the divisor? And what is the quotient? So how would I write that as an answer.

STUDENT: 1/3.

TEACHER: Mm-hmm. Beautiful. Yes, ma'am.

STUDENT: I don't get how much--

TEACHER: Just like what we did yesterday. If I was to take 1, and I was to divide it into 3. Let's draw that as a picture. Draw a 1. Divide it into 3. How much did you get? One what?

STUDENT: 1/3.

TEACHER: There you go. Just like we did yesterday. Beautiful. OK. Let's see, Jake? What is being divided? What is the dividend?

STUDENT: The dividend is the 3?

TEACHER: Is that what's being divided?

STUDENT: No, the 1.

TEACHER: The 1 is what's being divided. So remember when we were talking about problems earlier today? We were talking about-- oh, what were we talking about? We were talking about sandwiches and people. We had 4 sandwiches and 6 people. And we were talking about 4 divided by 6, or 6 divided by 4. So here how many sandwiches do I have?

STUDENT: 4.

TEACHER: One sandwich. I'm going to divide it between three people. OK. Let's put some context into that, contextualize the problem. So I've got one sandwich, which is what I'm going to divide up. I'm going to share for three people. How much would each person get, Steven?

STUDENT: 1/3.

TEACHER: 1/3. So let's complete that. One divided by three, one is the dividend, three is the, what?

STUDENT: Divisor.

TEACHER: Divisor. And what is my quotient?

STUDENT: 1/3.

TEACHER: 1/3. Let's move on. 7 divided by 6. 7 divided by 6. Can someone contextualize that problem for me? Come up with a word problem, just like I did with the sandwich just a second ago. Can someone come up with a situation where they have seven of something? Joel, give us some context.

STUDENT: There's seven crackers being divided into six people equally.

TEACHER: OK. Seven crackers. Six people want to eat them. How much does each person get? Caleb?

STUDENT: There's, like, seven crackers.

TEACHER: We just did seven crackers. No more food.

STUDENT: Seven toy cars and there's six kids. And you have to divide the seven cars between the six kids.

TEACHER: How are you going to do that?

STUDENT: Because some of the kids may have to share them.

TEACHER: OK. They could share it. But are you going to divide up that car? It's going to have to be something that we could divide up, right? So, just like we weren't going to cut up that person, we're not going to cut up the toy car. So we're contextualizing. We need to make sure that it's something that can be done. Yes? Marcella.

STUDENT: There's seven bottles of water and six people want to drink it.

TEACHER: That works. How much of the bottle would each person get. OK. Let's So let's move up. So, what is being divided? What is our dividend?

STUDENT: 7.

TEACHER: What is our divisor? How much is it being divided into?

STUDENT: 6.

TEACHER: 6. And what is our quotient?

STUDENT: 7/6.

TEACHER: 7/6. OK. Last one. Yes. Sir, excuse me.

STUDENT: Wouldn't we change it into a mixed number?

TEACHER: Could you change into a mixed number? Definitely. What would it be if it was a mixed number?

STUDENT: 1 and 1/6.

TEACHER: 1 and 1/6. And we'll get into that more in a little bit. OK. So 13 divided by 5. Alexa, can you come up with a contextualized problem for me?

STUDENT: You have 13 pies.

TEACHER: 13 pies. We're back to food. OK.

[LAUGHTER]

STUDENT: And you are sharing them with five people?

TEACHER: Five people.

STUDENT: And each person gets--

TEACHER: How many?

STUDENT: Pieces of pie?

TEACHER: How many-- or total pies. Yeah? OK. Let's come up with that. What is being divided?

STUDENT: 13.

TEACHER: What is our dividend? 13.

STUDENT: 13.

TEACHER: What is our divisor?

STUDENT: 5.

TEACHER: 5. What is our quotient?

STUDENT: 13/5.

TEACHER: 13/5. Can anyone tell you that in a mixed number? Bella.

STUDENT: 2 and 3/5.

TEACHER: 2 and 3/5. Do we agree?

STUDENT: Yes.

TEACHER: Wonderful. Moving on. Out of the bottom of your page there, we have a word problem about Miss Alexa. Alexa loves making fold-ables in math class. She is trying to decide where she should sit in a room to be able to have the best access to the construction box. Table one is a four-person table with one construction bucket, table two is a six-person table with two construction buckets, and table three is a five-person table with two construction buckets. Which table should Alexa choose to sit at if she wants access to the largest share of materials? Draw a picture to support your answer. And notice you can do this with your shoulder partner.

So talk it through with your shoulder partner. Draw some pictures. Attack it sentence by sentence.

[SIDE CONVERSATIONS]

STUDENT: Draw the table into, like this, a square. And then we can draw lines to show how many [INAUDIBLE]. And then we could draw the construction works in the middle

[SIDE CONVERSATIONS]

TEACHER: I was just saying, even when I'm figuring out things, I still draw pictures. Right? It helps us. Start drawing. Start drawing.

STUDENT: So I'm thinking that we should draw one table set and divide into how many people are there.

So we will need to make, like, how many--

So, like this. On table one, there's more people on table one.

TEACHER: Just make sure you're using your labels so that's not just a bunch of squares.

STUDENT: If you have six people and then two buckets, then they're all trying to get that one. But for table three there's only five people, but also has two construction buckets.

[SIDE CONVERSATIONS]

So maybe we should try it. Maybe we should see if she can, like-- if she can access that second construction bucket.

TEACHER: Which table is this?

Do you want to start with table one? Kind of go through an organized progression, maybe?

STUDENT: So how about we go through each one? So the first person, table one is a four-person table. So there's four people. So we can label four people.

TEACHER: So how many people are sharing these buckets?

STUDENT: And then there's only one box.

Yes.

We could just--

So we can divide into four.

Yeah and then each one would only get one. So I don't think it's number one for table one. OK. Now let's do table two.

I need to catch up.

But table three--

TEACHER: So, by having one extra person, what does that do to the probability of getting more access to the supplies?

STUDENT: Because--

TEACHER: It decreases your access? Because you're going to share with more people? Is that what you're thinking? OK.

STUDENT: Even though table one has four chairs less, it only has one construction bucket, which means less materials than two construction buckets.

TEACHER: So you think people would think it was table one just because there's fewer people? They're like, there's few people, right? That's why I should go?

STUDENT: Because at first, I was thinking that, but then I went and-- I was thinking, well, even though that only has one construction box, so she would-- and it wouldn't be table two because there's six people and it has two construction boxes, but this has five people.

TEACHER: OK. So talk to me about when did you decide that it wasn't the four table group? What did you do to change your mind about that?

STUDENT: Because it says--

TEACHER: I'm talking to Amaya. Amaya, what did you do that made you change your mind?

STUDENT: Well, it made me change my mind because when I went over it again I looked at it and then it said, I was, like, well, this--

TEACHER: Did you just read it or did you draw out a picture?

STUDENT: I draw out the picture. And this only one way from four and it has two construction buckets.

TEACHER: Definitely.

STUDENT: So I took-- I cast this one out and then I cast this one out.

TEACHER: Drawing that picture definitely not-- yes, sir?

STUDENT: With one thing from each box, which means that each person would get two things out of one box. Well-- each box, they would be able to get one thing. Which means they would probably be able to get--

TEACHER: All right. Can you come up--

STUDENT: The people would get one thing from this box and one thing from this box.

TEACHER: OK, guys. Can you come up with a division sentence to go with your pictures? Can you come up with a division sentence to share with your pictures? Let me do table one with you. Table one has, how many boxes?

STUDENT: Two.

STUDENT: One.

TEACHER: One box is going to be shared by how many people?

STUDENT: Four.

TEACHER: 1 divided by 4 equals 1/4.

STUDENT: 1/4.

TEACHER: OK? So I've done number one. We could do table two and table three and see if that supports your conclusion that you've already come to. To pull it back together, Caleb, what did you decide? Where did you decide Alexa should it? Which table?

STUDENT: Table three.

TEACHER: Table three. Why did you decide she should sit at table three?

STUDENT: I decided she should sit at table three because I sort of went by my model.

TEACHER: OK.

STUDENT: There are the-- it has more boxes than table one and it has less people than table two.

TEACHER: OK. So you were thinking about how many people I'm sharing with?

STUDENT: Yes, ma'am.

TEACHER: OK. Did anyone come up with anything after they did their fraction sentence after they did their equation? What was the equation for table two? 2--

STUDENT: 2 divided by 6 equals 2/6.

TEACHER: 2 divided by 6 equals 2/6, otherwise known as 1/3. Beautiful. Table three?

STUDENT: 2 divided by--

TEACHER: Divided by 5 equals 2/5. OK. So if I'm sharing two things with only five people, that seems like a better deal than sharing them with six people. I'd have more access, correct? Wonderful. We are ready to move on to our guided practice for the day.

The landscaper problems are in the back of your sheet. A landscaper poured four pounds of mulch into three pots. What is the weight of the mulch in each pot? I want you to stop for a minute and I want you to start by thinking about the number sense first. I want you to think about the number sense first. Don't jump into trying to solve it with computation and pictures and everything else. I want you to think about the number sense first.

Think about what you have that's being divided and how many is being divided into, what is my dividend, what is my divisor.

STUDENT: Four and--

TEACHER: What is being divided? Are the pots being divided or is the mulch being divided? Which one? This has the pots being divided. Which number goes with the mulch?

STUDENT: Four.

TEACHER: The four pounds. You are dividing the pots.

STUDENT: And I think the--

TEACHER: That's what erasers are for. So we talked about this a dozen times, right? A dozen, dozen, dozen. Much more than dozens. We are going to learn so much more from the mistakes that we make than we're going to learn from the successes. So let me put you a hand here for a minute. I've got four pounds, right? I need to share with three pots. Can I fit one of these pounds into each pot? Look. 1, 2, 3. 1, 2, 3. Number sense. Is there enough that everyone gets one? Look at these fingers.

STUDENT: They're going to get more than one.

TEACHER: They're going to get more than one. Were you getting more than one?

STUDENT: No.

TEACHER: Number sense. Start with the number sense. Don't jump into an equation until you consider the number sense first. Will you tell me? Why are you guess--

STUDENT: Because there's three pots.

TEACHER: OK. There's three pots and there are-- are you-- what are you sharing? Boys and girls, come together, please. Let's discuss this really carefully because we need to talk about the number sense first. Everyone put up four fingers. What does that four fingers represent?

STUDENT: The four pounds.

TEACHER: The mulch, OK? The mulch. What is being shared, the mulch or the pots? The mulch. So is that the dividend or the divisor?

STUDENT: The divisor.

TEACHER: The dividend. So which number is going to go first, the four or the three?

STUDENT: Four.

TEACHER: Four. Four bags of mulch-- four pounds of mulch, excuse me, are going to be divided into three pots. Put your three pots in front of your four pounds. Does it look like these three pots are going to have more than one pound or less than one pound?

STUDENT: More.

TEACHER: More. Why, Evan?

STUDENT: [INAUDIBLE]

TEACHER: Very good. So let's think about that. For those of us that we wrote 3 divided by 4, you were getting 3/4. Just my number sense alone tells me that each pot should get more than one pound. Is 3/4 more than one pound?

STUDENT: Less.

TEACHER: Less than one pound. So right there, ding, ding, ding, ding. My number since is off. OK? So let's think about what is being divided. The four pounds of mulch is the dividend. OK, so I think it sounds like we're being ready to share. Yes? OK. I need one person to come up here and share their piece. Who haven't I talked to, lately? I've talked to all of you, good Lord. Let's go with Marcella. Marcella, come up here.

STUDENT: I knew that 4 would be my dividend, so I drew four bags of mulch, and then I put-- I divided it by 3 because that's our divisor. And then I put three pots under my four bags of mulch. And then I distribute them--

TEACHER: Distributed them?

STUDENT: To my three pots. And each of the pots would give me four bags of mulch-- four--

TEACHER: 4?

STUDENT: 4/3.

TEACHER: Thirds. Very good. 4/3. OK. That is one way to do it. Today, we're going to come up with a different way where they didn't end up with an improper fraction.

STUDENT: I did. For squares for four pounds and there's writing there, but you get the idea.

TEACHER: We get the idea. Yes.

STUDENT: And I knew that three of the pounds would go in-- one pound each would go on to one pot and the last one over here [INAUDIBLE]. I broke it up into three pieces and one of those each would go into one of the pots. And I got 1/3 but also 4/3.

TEACHER: Very good. So we looked at dividing all the bags into thirds and distributing each third. And here, Tory distributed whole bags at a time. Why would she do that? Because there are fewer-- excuse me, fewer pots than there were pounds. I keep calling them bags. They're pounds. There are fewer pots than there were pounds.

So we're going to change this problem a little bit. But this time, we're going to double. Let's read what it says. A landscaper doubled the number of pounds of mulch poured into the three pots. What is the weight of the mulch in each pot now?

Don't even start solving yet. I want you to think. I want you to predict, based on the first problem, what is your prediction of how many pounds are going to be in the pots now. Let's put our hands down. Think about it. Think about the first problem, transfer that information, apply it to this new situation, talk with your partner first. Come up with an equation, then draw your pictures. Go ahead, please.

[SIDE CONVERSATIONS]

STUDENT: And then we can just draw a picture like we both did up here. Yeah. It's eight pounds.

TEACHER: So that's your strategy. Tell me about your prediction. I want to hear the prediction. If this was 4/3 and I doubled.

STUDENT: We thought it was going to be 8/3 because this is 4/3, so if we double 4, then you'll get 8.

TEACHER: Because the pots isn't changing. Right? Just the weight of the pounds. So we're going to be transferring that knowledge over. So how could we do that? Do we have to do-- Should we multiply it? Should we do long division? What are we going to do? How are we going to figure that out?

STUDENT: Well, first, we just did it 4 times 2 since they doubled after we predicted. And then-- so we just thought it would just be like this, so we just did 8 divided by 3.

TEACHER: OK. So did we do long division or did we do in our head? What did we do?

STUDENT: We did--

TEACHER: Mental? Mental math?

STUDENT: Yeah.

TEACHER: Mental math division? Yeah? Could we have done repeated addition or multiplying by 2?

STUDENT: Yeah.

TEACHER: How? Why?

STUDENT: Because here you're doubling the math.

TEACHER: What did you guys decide as a prediction?

STUDENT: 2 and 2/3.

TEACHER: Why did we come up with 2 and 2/3?

STUDENT: Because-- well, four times-- well, since the last problem was 1 and 1/3, you could just multiply 1 and 1/3 times 2.

TEACHER: Why?

STUDENT: Because you're doubling the amount of four pounds.

TEACHER: What if I didn't want to multiply? How could I have done it?

STUDENT: You could have added 4 plus--

Because with added, being 2 and 2/3, you have got 8/3 as an improper fraction.

TEACHER: So I could have done division for that? OK. Could I have done repeated addition anywhere? How could I have done that switch?

STUDENT: You could have done 1 and 1/3 plus the 1 and 1/3.

TEACHER: Is it the same thing as 1 and 1/3 times 2?

STUDENT: Yes.

TEACHER: OK. So lots of different strategies here. How did we do? 2 and 2/3. Where did we put them? We owe that 2 and 2/3?

STUDENT: Yes. And the beginning, I actually kind of thought of it. I'm thinking that each could get three bags and I was thinking two bags, so double the 1/3 because that was just one bag.

TEACHER: So you distributed whole bags? Could we have just thought about the 1 and 1/3 doubled?

STUDENT: Yes.

TEACHER: What does that mean, 1 and 1/3 doubled?

STUDENT: Times 2.

TEACHER: Times 2, or-- if I didn't want to do times 2, what else could I have done?

STUDENT: Divide?

TEACHER: What is multiplication?

STUDENT: Repeated addition.

TEACHER: Repeated addition. Right? Very good. So it's repeated addition. OK. So it sounds like we came up with the fact that we really didn't need to do much computation here because we determined that if we were going to double 1 and 1/3, how could we do that? Xavier, how did your table double 1 and 1/3?

STUDENT: We times it by 2.

TEACHER: You multiplied it by 2. Did another table do it in a different way? If I didn't want to multiply, what was another way I could do it? Alec?

STUDENT: You could have divided it.

TEACHER: I could have divided the 8 divided by 3. I could have done that. But let's stick with the 1 and 1/3. What could I else have done to the 1 and 1/3? Sebastian?

STUDENT: Added 1 and 1/3 plus 1 and 1/3.

TEACHER: Why?

STUDENT: Because it is the same as 1 and 1/3 times 2.

TEACHER: Repeated addition and multiplication. Hand in hand. So let's look at number one together. The division expression is 4 divided by 3. Where did the 12/3 come from? Think back to yesterday's assignment. So, everyone, make sure that you're paying attention to that. If you need help, remember there's the division sheet over there to help you decide where the dividend goes. The dividend goes in the bracket. The divisor goes outside of the bracket. Remember, if we flip-flop them it's different, correct? It's not like multiplication where you've got the communitive property. In division it's not going to work the same.

OK. So you're going to work with your partner to complete this chart. Please look for patterns between b and c. Look for patterns between b and c. And then look for relationships between 2a and 2b once we get to the next sheet. But start this one. You got 10 minutes to complete this front, this front. And let's start trying to get back done, too.

Who's your partner?

STUDENT: Abby.

TEACHER: OK. Are you and Abby talking to each other?

STUDENT: Yes.

TEACHER: What did you come up with, so far?

STUDENT: So far, we've come up with since 4 times 3 is 12/3, then we needed to do 6 times 5 to make 30/5.

TEACHER: Very good. OK.

STUDENT: And then, 30 divided by 6, or divided by 5, would be 6/5.

TEACHER: So what we're going to write there?

STUDENT: 36.

TEACHER: OK. You just told me that. Can you explain why? Let's take a look at what it says for the check on your sheet. Let's look at problem 1a. Why does my check say three times 1 and 1/3? I thought I'm dividing. Why does it say 3 times 1 and 1/3? Steven?

STUDENT: Because whenever you're checking division, you do the opposite.

TEACHER: The inverse operation. There is a strong relationship between multiplication and division? So let's try that and see if this works 3 times 1 and 1/3. 1 and 1/3 was my quotient, correct? Three was my divisor, so now I'm going to multiply them together and see if I get the dividend that I had. So I'm going to use repeated addition. 1 and 1/3 plus 1 and 1/3 plus 1 and 1/3 is going to give me 3 and 3/3. Can we agree with that?

STUDENT: Yes.

TEACHER: What is 3 and 3/3?

STUDENT: 4.

TEACHER: 4. Was that my original dividend?

STUDENT: Yes.

TEACHER: Check. Look at the problem, number one. Was that my original dividend? Yes. So that's how I check. So let's look at problem number two. What am I going to use, first of all, as my equation? I had 6 divided by 5 equals what? Equals 1 and 1/5. Is that what you said? OK. How did you come up with 1 and 1/5 because it was 6/5. How did you come up with 1 and 1/5?

STUDENT: 5 could go into 6 one time. It would be 1 left.

TEACHER: Beautiful. 5. Very good. So I'm going to be repeated addition. How many times am I going to do that?

STUDENT: 5.

TEACHER: 5 times. 1 and 1/5 5 times. Let's do the ones first. 1 times 5 is 5 or 1 plus 1 plus 1 plus 1 plus 1 is 5. And then I'm going to do 1/5 five times. What happened?

[SIDE CONVERSATIONS]

OK. So you got it backwards? So think about when we're dividing, what We're doing is, we're pretty much multiplying these to be able to subtract it, right? So you're thinking about that relationship. So make sure that you're hitting that relationship. So you're looking at the 2 and 2/3 times 3.

So, how would I write that as a fraction?

[SIDE CONVERSATIONS]

OK. So write that. That's what we have here. OK. So how many halves is that?

[SIDE CONVERSATIONS]

Because look what you did here. You said 3 times 8 is 24. 6 times 5 is--

STUDENT: 30.

TEACHER: 2 times 7 is--

STUDENT: 14.

TEACHER: 14 what? Halves. Yes. Yes.

[SIDE CONVERSATIONS]

Well, 2 is halves. You know? Cut him some slack. Eyes, please. I watch around and I've noticed that we're all doing this naturally because we've been working on this, but let's talk about this for a minute. If we're doing straight algorithm division and we weren't thinking about the fraction, we would just call this the what? The remainder. But we're trying to find out the fractional pieces. So what are we going to do with that remainder now? We're going to make it a-- it's going to become the numerator of the fraction. So it's going to be 1 and 1 what?

STUDENT: Third.

TEACHER: Third. Where did the 3 come from? From the divisor. OK. It came from the divisor. We were all doing that already, but I had forgotten to pull us back to that. So I wanted to make sure that we were coming back around to there. Once again, make sure that you are doing your multiplication check. We're going to stop here.