Project INSPIRE Grades 2-5 Course 2 Lesson 1 (25:33)

SPEAKER: Welcome to Grades 2 to 5: Nemeth Code Symbols for Fractions and Spatial Problems, Instructional Tools, Materials, and Technology. This is "Lesson 1: Fractions and Mixed Numbers." Slide 2 has the objectives for this lesson. You're going to be able to read and write, using Nemeth code, simple fractions, mixed numbers, and linear math problems and word problems that use fractions and mixed numbers.

So let's get started on slide 3 by talking about simple fractions. I have the fraction two-thirds, and this is written in print with a 2, a line drawn underneath it, and a 3 under that line. That 2 is the numerator or the top part of the fraction. It's the number of parts being counted.

Then we have the fraction line. In this case, it's a horizontal fraction line. It's going straight across. And that is important for us to recognize, and we'll talk about why in just a few minutes.

That fraction line separates the numerator, that top number, from the denominator, or the bottom number, in this case 3. And the denominator is the number or the whole total of the parts. But what we really want to get at is how do we actually do this in Nemeth code.

Keep in mind that a simple fraction does not have a fraction in the numerator or denominator. So, for example, it's not one-half over 3. We have to not have a fraction. Otherwise, that becomes a complex fraction, and that's definitely not in the 2nd to 5th grade realm, guys.

So let's go on to slide 4 and break this down in how we actually write a simple fraction in Nemeth code. So I have three symbols I need to know. The first is the opening simple fraction indicator, brailled with dots 1-4-5-6, and then the closing simple fraction indicator, brailled with dots 3-4-5-6.

And you're going to say, but wait, narrator, that's the numeric indicator. And narrator is going to say right back to you, no, it is not when it is positioned in a simple fraction. Numeric indicators come at the beginning. We're going to close our fractions at the end of the fraction. Remember, we only have 64 possible dot combinations here with six dots, so we have multiple uses for our dots.

The horizontal fraction line is dots 3-4. So I'm going to take that two-thirds, and let's take a look at it again, but this time in Nemeth code. I am going to always begin my fraction with the open simple fraction indicator when I'm doing a simple fraction, so that's, again, dots 1 4 5 6, put my numerator-- this case, it's a 2. I'm going to then put my horizontal fraction line, which is dots 3 4. Then my denominator-- in this case, a 3, and then I'm going to close my simple fraction with dots 3 4 5 6.

So based on the position of those dots for the closing simple fraction indicator, I know it's not a numeric indicator, because numeric indicators start numbers. Keep in mind that your student and you need to recognize that there are no print equivalents for the opening and closing simple

fraction indicators. So this is one of those instances where things are a little bit different in braille, because a print reader does not need to open and close their simple fractions. It's very important that when you open a fraction, you must always, always close it. And when you're preparing braille materials for your student, you really want to check yourself. This is probably the most common mistake folks made when they're preparing materials is they forget to close their fractions.

Let's go on to slide 5. And we're going to now have a simple fraction, but this time it has a diagonal fraction line. So it's not straight across between the numerator and denominator, rather it's on a diagonal.

In this example, I have one-half. So my diagonal fraction line is brailled now, taking two sets, dots 4-5-6 in the first and dots 3-4 in the second. So if I look at my example of one-half, always going to open up that simple fraction the same way, which is dots 1-4-5-6, this time, because my diagonal fraction line is used, I'm going to do dots 4-5-6., 3-4, after the numerator, which was 1, followed by the denominator, which is 2 in this case, and remember, I said, you always close a simple fraction with dots 3-4-5-6.

Our tactile readers are really doing things from left to right, not top and bottom. So it's important with your students that you make sure that they understand in the general ed classroom, the teacher is going to be talking about the top numerator and the bottom denominator. And really, for them in braille, it's the left numerator and the right denominator. So help them understand that it's different in print than it is in braille.

I'm going on to slide 6. And I'm going to show you a couple of examples of these fractions. So I have four-sevenths written both ways. I have four-sevenths using my horizontal fraction line, so open simple fraction indicator, 4, then I've got dots 3-4, because it's the horizontal fraction line, denominator 7, closing simple fraction indicator.

When I have four-sevenths written with the diagonal fraction line, it's almost the same thing. I'm just going to be adding in that cell of 4-5-6 in front of the 3-4 in my fraction line. So four-sevenths written diagonally is open fraction indicator, 4, then that diagonal fraction line, 4-5-6, 3-4, and then 7, and then my simple closing fraction indicator. So I'm following the print.

So when a fraction occurs in a math problem, I'm also going to follow the print. So I have two example problems. The first one is five-ninths plus two-ninths equals blank. And that blank is shown by a line. So we're going to use our long dash, which is four cells of dots 3-6.

I look at my two fractions here, five-ninths and two-ninths, and I see that I'm using a horizontal fraction line. So that is what I'm going to use in my braille. So open fraction indicator, 5, dots 3-4, which is my horizontal fraction line, 9, close that simple fraction, immediately following is the plus sign, dots

3 4 6, I'm opening up my next fraction, which is two ninths, so open simple fraction indicator, 2, that horizontal fraction line, dots 3 4, 9, and then I'm going to close my second simple fraction in this problem, dots 3 4 5 6, space, equals, space, long dash. The same thing in the second

problem, which is three fifths plus question mark equals four fifths. This time my fractions are written using a diagonal fraction line. That question mark is represented with the general omission symbols, the full cell.

So if I go through that problem, open fraction indicator, simple fraction indicator, 3, diagonal fraction line, 4-5-6, 3-4, 5 for my denominator, simple fraction close, plus general omission symbol, space, equal sign, space, I'm going to open up now my second simple fraction of four-fifths, so opening 1-4-5-6, 4, my diagonal simple fraction line, 4-5-6, 3-4, my denominator, which is 5, and then I'm going to close the simple fraction with dots 3-4-5-6.

So your job is to follow the ink print and to ensure that your students see the same problem that their print reading peers see. Let's going on to slide 7. Slide 7 puts you to work. You're going to be doing Activity 1A.

So I have four fractions and equations that I'd like you to go ahead and interline. When you're ready, come back and check your work. Okay, slide eight 8 has the answer key for this activity. Did you interline your fractions properly? Did you make sure that your diagonal fraction lines are where they need to be and your horizontal fraction lines are where they need to be?

Let's go on to slide 9. I want to talk to you about mixed numbers. So my example mixed number is 4 and five-eighths. First, I have the whole number, which is the 4 in this case, obviously. And then I have my fraction, which in this case is five-eighths.

And the same thing we went over before, the numerator is the top part or the number of parts being counted. This time I have, again, a horizontal fraction line, as I did in my first example of a simple fraction. And then 8 is my denominator, which is that bottom part. I also could have my mixed number written with a diagonal fraction line. So my bottom example is 3 and one-seventh.

Slide 10 talks about how to braille mixed numbers. I begin my mixed number with my whole number, so numeric indicator, and then the whole number, then I do my opening mixed number fraction indicator, this is two cells, dots 4-5-6, dots 1-4-5-6, I use the same horizontal fraction line, dots 3-4, or the same diagonal fraction, dots 4-5-6, 3-4, as I do with simple fractions, so no change there, and to close the mixed number, I'm going to use my closing mixed number fraction indicator, which is dots 4-5-6, 3-4-5-6.

Let's take a look at how to braille 4 and five-eighths when I have a horizontal fraction line. So I'm going to begin with my numeric indicator, 4, I'm going to open the fractional part of the mixed number, dots 4-5-6, 1-4-5-6, braille 5 for my numerator, my horizontal fraction line, dots 3-4, braille my denominator, in this case 8, and then I'm going to close my mixed number with dots 4-5-6, 3-4-5-6, or my closing mixed number fraction indicator.

If I take 3 and one-seventh, notice that I have a diagonal fraction line. So I'm going to follow the same pattern but make sure I use the correct fraction line. So numeric indicator, 3 is my whole number, 4-5-6, 1-4-5-6 for my opening mixed number fraction indicator, numeric indicator, 1, that diagonal fraction line, 4-5-6, 3-4, my denominator in this case is 7, and then I'm going to

close my fractional part of my mixed number with dots 4-5-6, 3-4-5-6, or my closing mixed number fraction indicator. That's quite a mouthful.

Slide 11 has three examples. The first one is 24 and two-thirds. I'm going to be using my horizontal fraction line, because that's what's in the ink print. So numeric indicator, 24, for my whole number, I'm going to open up the fractional part of the mixed number, 4-5-6, 1-4-5-6, numerator, my horizontal fraction line, dots 3-4, my denominator, which is 3, then I'm going to close the fractional part of the mixed number, 4-5-6, 3-4-5-6.

8 and four-fifths is written with a diagonal fraction line. So I'm going to begin with my numeric indicator, 8 for the whole number 8, opening up the fractional part of the mixed number, 4-5-6, 1-4-5-6, brailling my numerator, which is 4, that diagonal fraction line takes two cells, 4-5-6, 3-4, the denominator is a 5 in this case, and then, again, making sure I close with 4-5-6, 3-4-5-6.

759 with three-sixteenths So numeric indicator, 759, same pattern, folks, opening up with 4-5-6, 1-4-5-6 for the fractional part of a mixed number, numerator, got that, fraction line, dots 3-4, it's horizontal, my denominator is 16, and making sure I close the fraction part of the mixed number, 4-5-6, 3-4-5-6.

I felt very repetitive saying this over and over again with these examples, and you'll start to feel that way as you braille them. So though they look complicated to braille, fractions and mixed numbers are not hard, because we're following a pattern. Slide 12, we're going to look at how do I use my mixed numbers in linear problems. The same way I used my simple fractions-- I'm going to follow my ink print.

My first problem is 5 and four-fifths is less than 6 and one-third. I'm going to just chug along, just the way we did in the examples. Numeric indicator, 5, open my fractional part, 4-5-6, 1-4-5-6, my numerator 4, that diagonal fraction line, 4-5-6, 3-4, that denominator is 5 in this case, and then I'm going to close that mixed number with 4-5-6, 3-4-5-6.

I'm going to do by less than sign, which, remember, takes two cells, dot 5, 1-3. And then I'm going to be brailling 6 and 1/3. So numeric indicator 6. Two cells to open up the fractional part, 4-5-6, 1-4-5-6, 1. Got to get that diagonal fraction line in there-- 4-5-6, 3-4. My denominator, of course, is 3, and then I'm going to use two cells to close my mixed number, 4-5-6. 3-4-5-6.

In this case, 5 and four-fifths is less than 6 and one-third. I just had a sign of comparison. But often our students are going to be adding or subtracting fractions. They need to have a sign of operation.

When I have a mixed number following a sign of operation, for example, in my problem here, 3 and seven-tenths minus one and how many tenths, so there's a question mark, our student needs to figure that out, equals 2 and three-tenths.

I want you to focus on that 1 and question mark, 10. Notice how that 1 comes after the minus sign. Once we're in a math problem, we do not, DO NOT, need a numeric indicator in front of that whole number 1. So let's go through our example together and take a look.

Follow along with me, and make sure you have the rationale. So let's do it together. Get some excitement going.

We are going to braille 3 and seven-tenths. Numeric indicator, 3, open the mixed number part, 4-5-6, 1-4-5-6, numerator is 7, horizontal fraction line, 3-4, denominator 10, close that mixed number, 4-5-6, 3-4-5-6, minus sign, dots 3-6.

Go right in, because I know I'm in math, to that whole number of 1. I do not, DO NOT, need a numeric indicator in front of that 1. So I've closed my mixed number, minus, 1, open the fractional part, 4-5-6, 1 4 5 6, something's missing here my student needs to fill in, so I'll put a general omission symbol to let the student know that's a question mark, then I've got my horizontal fraction line, 3 4, my denominator is 10, and, of course, I'm going to make sure I close, 4 5 6, 3 4 5 6, space, equal sign, space, numeric indicator 2, because I'm after a sign of comparison, I need the numeric indicator, open up my mixed number part, fractional part, so I'm going to do 4 5 6, 1 4 5 6, 3, my horizontal fraction line, 10, close with 4 5 6, 3 4 5 6.

So I want you go back, and if you have any questions, take a look at this. You may even want to try brailling this problem and comparing what you braille to what I've brailled.

Let's go ahead and go on to slide 13. And it's your opportunity to do Activity 1B and interline the mixed numbers and equations that I've provided you. When you're ready, please come back.

Slide 14 has the answers to Activity 1B for problems 1, 2, and 3, and slide 15 has the answers to Activity 1B for problems 4 and 5. Go ahead and check your work. Did you interline properly? Do you have all the fractions and mixed numbers formatted properly? Do you have everything that you need as far as your signs of operation and your signs of comparison go?

Activity 1C is on slide 16. And it's time now for you to braille what you've been practicing reading. So you have six problems to braille. When you're ready, please come back.

Slide 17 has the answer key to Activity 1C for the first three problems. So ensure that you brailled those problems correctly. Did you close all your fractions and mixed numbers? I sure hope so. And slide 18 has the answers for problems 4, 5, and 6 in Activity 1C.

The last topic we're going to talk about on slide 19 is word problems that contain fractions. Obviously, simple fractions and mixed numbers are Nemeth code. So if I'm in a word problem and I'm not already in Nemeth code, before either my simple fraction, or my mixed number, or an equation containing one or both types of these items, I need to open up Nemeth code. And once I'm done, if I'm going back into words, I would be closing Nemeth code.

I want you to be very careful. You cannot, CANNOT, divide a fraction or a mixed number between lines. So in other words, I CANNOT put the whole number for a mixed number on one line and the fractional part on the next line. I need to bring it all down together.

You really want to avoid dividing equations, especially when your students are at the beginning stages of learning the math concepts around simple fractions and mixed numbers. Don't divide a

problem. If you must divide a problem, you need to do so at the sign of comparisons, so the equals sign, the less than, or the greater than sign.

My last point I want to make on slide 19 has to do with measurements. Now, sometimes we write out words, like "inches," or "kilometer." Those are words. Those go in UEB. But often in math we abbreviate. For example with "i-n" for "inch" or "inches," or "k-m" for "kilometers."

If I have an abbreviation for the measurement, then it must be in Nemeth code. So it must be enclosed within the Nemeth code symbols. Let's go on to slide 20, and I'll show you an example of what I mean.

I want you to take a look at the first word problem and read the print to yourself. Did you notice that you had two mixed numbers? Both mixed numbers have the abbreviation "i-n" in this case. Both of these mixed numbers have a diagonal fraction line between the numerator and the denominator. So when I go to braille 8 and a half inches and 3 and five-eighths inches, I'm going to need to open up Nemeth code, and then I'm going to need to terminate Nemeth code after the abbreviation for inches.

So if you look at the braille, you'll see I did exactly that. I began in UEB with 15, period, "Dennis caught a fish", notice how I've opened up Nemeth code with my opening Nemeth indicator, I brailled my mixed number 8 and one half, notice two cells to open and closed that on the fractional part, and then I use my diagonal fraction line, space, "i-n" written out. We don't use contractions within Nemeth code and even if I were, you cannot contract the abbreviation "in", closing Nemeth code with my terminator, I then go back to UEB until I get to the 3 and five eighths, again, it takes two cells to open up Nemeth code, I'm going to do my whole number 3, I'm going to open up the fractional part for five eighths. I'm going to use the diagonal fraction line, my denominator 8, and then I'm going to close that mixed number, 4 5 6, 3 4 5 6, space, "i n" written out, space, and then I'm going to terminate Nemeth, go back into UEB, and finish the rest of the problem.

Let's go on to slide 21. I have problem 16 here. "Does three-fourths plus 5 and a half equals 5 and four-sixths, question mark? Explain why or not." I want you to take a second to think about how you're going to braille this.

Alright, one thing I didn't tell you was that your braille paper ends about where the 5 and one-half gets brailled. So think for a second what you're going to need to do. Let me show you my braille.

Did you come up with what I came up with? Which was, I brought my equal sign down to the next line, so it starts on the second line, and then I brailled the answer here, 5 and four-sixths. Because I know that the only place I can divide a math problem is at that the sign of comparison.

So let's take a look. So I start out in UEB: 16, period, "Does," and then I open up Nemeth, 4-5-6, 1-4-6, then space, I'm going to open up my simple fraction, do my three-fourths, close that simple fraction, plus, make sure that I just do dots 2-6 for 5, no numeric indicator, because I'm in a math problem, so I'm going to do my 5, open up the mixed fraction part with 4 5 6, 1 4 5 6, my

numerator 1, 4 5 6, 3 4, for my diagonal fraction line, my denominator 2, and then I'm going to close that mixed fraction with 4 5 6, 3 4 5 6, Onto the next line, I have equals, space, and then I'm going to braille 5 and four sixths so my normal pattern of numeric indicator, 5, that's because it's after a space so sign of comparison, open the mixed fraction part, 4 5 6, 1 4 5 6, my 4, my diagonal fraction line, my 6 for my denominator, and I'm going to make sure I close that mixed fraction, 4 5 6, 3 4 5 6, put my space, and I'm going to terminate Nemeth.

Now, did you think that that question mark should have gone before I terminated? If you did, let me explain to you why it goes where it goes, which is after I returned to UEB. That question mark ending, "Does three-fourths plus 5 and one-half equal 5 and four-sixths?", is part of the question. That question mark is not part of the math. So it goes in UEB. And then I finish up the math problem, "Explain why or why not."

Slide 22 puts you to work. I want you to go ahead and do Activity 1D. When you're done, come on back, and let's check your work. And slide 23 ends it for you here with the answer key to Activity 1D. Make sure that you're comfortable brailling your fractions, simple fractions, and mixed numbers, using them in equations, and when to use your opening and terminating Nemeth indicators.

Thank you for taking part in lesson 1. It's time for you to go on to lesson 2 and learn about spatial problems.