

Grades 2-5 Lesson 3

SPEAKER: Welcome to "An Introduction to Nemeth Code Symbols Used in Grades 2 to 5 and Strategies for Supporting Elementary Students in Building Math Skills." This is lesson 3, "Grouping Symbols and Superscripts."

Slide 2 has the objectives for this lesson.

The first is you will be able to read and write Nemeth grouping symbols. And the second is that you'll be able to read and write the symbols for superscripts, also known as exponents, the baseline indicator, and the degree sign.

Slide 3 gets us going with grouping symbols. We're going to focus on parentheses, brackets, and braces. To make the opening parentheses, it's dots 1-, 2-, 3-, 5-, 6. And the closing, or right parentheses is dots 2-, 3-, 4-, 5-, 6.

I like to think of the dot 4 missing in the opening or left parentheses is that dot pointing towards what's inside the parentheses. And with that closing or right parentheses, the missing dot 1 is pointing to what we have inside the parentheses. It might help your students.

Now, in order to make a bracket, we simply put the dot 4 in front of the opening or left symbol and the dot 4 in front of the right or the closing symbol. So the opening bracket, is dot 4, 1-, 2-, 3-, 5-, 6. And the closing bracket is dot 4-, 2-, 3-, 4-, 5-, 6-- also known as the right bracket.

Same pattern with the brace. So opening brace, two cells, dots 4-, 6-, 1-, 2-, 3-, 5-, 6. And that right or closing brace is 4-, 6-, 2-, 3-, 4-, 5-, 6.

Now on slide 4, we talk about actually using these with students. And it's about 5th grade when they begin to learn about parentheses and brackets and braces. When you have a grouping symbol and you're doing material in Nemeth Code within UEB context, you're always going to use the Nemeth equivalent, if you're in the Nemeth Code part of the material.

When you have a single number or mathematical expression, and it's the only thing inside of that grouping symbols, there's no need for a numeric indicator. I have three examples. Open parentheses, 4, close parentheses, open parentheses, 6, close parentheses. So I'm just simply, for that opening parentheses, putting 1-, 2-, 3-, 5-, 6, my 4, my closing parentheses, 2-, 3-, 4-, 5-, 6. Open up again. 1-, 2-, 3-, 4-, 5-, 6. Got my 6 and my closing 2-, 3-, 4-, 5-, 6. Notice no numeric indicators, no spaces.

Next example open parentheses, 7, closed parentheses, open parentheses, .2, close parentheses. Same pattern as above. Open, with -1, 2-, 3-, 5-, 6 for my parentheses, my 7, my closing parentheses, 2-, 3-, 4-, 5-, 6. Going to open up again, with my 1-, 2-, 3-, -5, 6. Right away, the decimal .2. And then I'm going to close my parentheses with 2-, 3-, 4-, 5-, 6. Remember, we also can say left and right as opposed to open and close. So you'll want to find out what term is being used in the math book and by the math teacher.

So here I have my left parentheses, -- 3 minus 2, -- my right parentheses, my left parentheses, 8 plus 5, my right parentheses. Following the imprints, I'm going to do my left parentheses-- 1-, 2-, 3-, 5-, 6, -- my 3 minus 2, my right parentheses-- 2-, 3-, 4-, 5-, 6. Now it's time to do my left parentheses for the second expression-- 1-, 2-, 3-, 5-, 6 -- 8 plus 5, and now I have my right parentheses-- 2-, 3-, 4-, 5-, 6.

So the key thing to remember here is that you follow the imprint. And when we have numbers or mathematical expressions enclosed inside of a grouping symbol, such as a parentheses, there is no numeric indicator.

Let's go on to slide 5. It's going to get a little more complicated here. We're going to start combining grouping symbols. One thing you really want to point out to your students is if you open up a mathematical expression, you want to make sure you close it.

So if you have an opening parentheses, you're going to have a closed parentheses. So my first expression is 3, open bracket, 18 minus, open parentheses, 17 minus 6 plus 4, closed parentheses, closed bracket, equals long dash. Whew, that's a lot in braille.

But we can do it, because we're just following the imprint. I'm going to start out with numeric indicator, 3. I'm going to open my bracket, -- dot 4-, 1-, 2-, 3-, 5-, 6. I've got my expression, -- 18 minus. Now, I've got my opening parentheses-- 1-, 2-, 3-, 5-, 6, -- 17 minus 6 plus 4, close parentheses-- 2-, 3-, 4-, 5-, 6. And then my closed bracket, dot 4-, 2-, 3-, 4-, 5-, 6. Add that space, that equals sign, another space. And then I get that four cell long dash. Woo-hoo.

All right, next one, I'm going to be using my braces to start off. Because I'm going to have open brace, 4 plus, open bracket, open parentheses, 3 minus 2, closed parentheses, open parentheses, 6 plus 4, close parentheses, closed bracket, minus, 14, close brace.

So let's take a quick look here. I'm going to go ahead and start right out with that brace, -- 4-, 6-, 1-, 2-, 3-, 5-, 6-, 4 plus. Now, I'm opening up my bracket. So that's dot 4, 1-, 2-, 3-, 5-, 6, open parentheses, 1-, 2-, 3-, 5-, 6. And now I'm doing 3 minus 2.

I'm going to go ahead and close that parentheses-- 2-, 3-, 4-, 5-, 6. Open the next parentheses-- 1-, 2-, 3-, 5-, 6-, 6 plus 4. Close that parentheses, -- 2-, 3-, 4-, 5-, 6. Close that bracket now, -- dot 4-, 2-, 3-, 4-, 5-, 6, minus 14. And then we're going to close our brace with 4-, 6-, 2-, 3-, 4-, 5-, 6- - my space, my equals sign, my space.

And because I want the student to write-in the answer, I use my general omission symbol to show them that there is an answer they need to fill-in. That's a lot of braces and brackets. But what I wanted you to really focus on is everything I opened, I closed, and I followed the imprint.

Now, for slide 6, we talk about the fact that sometimes problems are identified. So they're numbered using a number that is with a grouping symbol, -- typically, the parentheses. When I have a parentheses as part of the problem identifier, I need to look to see whether I have that open parentheses or not. Going to follow the imprint.

So I have two examples here. The left, I have problems that have opened parentheses, 1, closed parentheses as the problem identifier. And open parentheses 2, closed parentheses is the identifier.

So to braille those identifiers, I'm going to do exactly what I've been doing, -- my open parentheses, 1-, 2-, 3-, 5-, 6. My 1, my closed parentheses, 2-, 3-, 4-, 5-, 6. So you've got a nice example here, showing you 3.5, open parentheses, 7.8 minus 3.4, closed parentheses.

My problem 2, we're focusing on the identifier. So I'm going to open my parentheses, -- 1-, 2-, 3-, 5-, 6, my 2, my closed parentheses, 2-, 3-, 4-, 5-, 6. And then I go on to braille the problem, \$2.75 times 2, and both of those are in parentheses.

Now, if you look on the right side, you'll notice that my two problems have the number followed by the closing or right parentheses. So in this case, we would call it a right parentheses. So to braille that problem identifier, 1, I'm going to do my numeric indicator, 1.

I have to put the numeric indicator there, because we're not starting with that left parentheses. So numeric indicator, 1, right parentheses, 2-, 3-, 4-, 5-, 6. And in this example, I have open parentheses, 35.67, closed parentheses, open parentheses, 26, closed parentheses.

The same thing happens with problem 2. So again, there's no left parentheses. So I'm going to start with my numeric indicator, 2, my close parentheses, 2-, 3-, 4-, 5- 6. And in this case, I open parentheses, 7, closed parentheses, open parentheses, \$8.69, close parentheses.

So our job is to ensure our student has access to the same material as print readers, so we want to follow the way the problems are identified-- how we use our grouping symbols and numeric indicators. Let's go ahead and go on to slide 7, which is Activity 3A. So I'd like you to interline the problems. When you're done, come back to check your work.

Slide 8 has the answer key for Activity 3A. Make sure that you used your grouping symbols properly, and that you used your problem identifiers the way they were intended.

Slide 9 has Activity 3B. Now it's your turn to transcribe problems that are using grouping symbols. Remember, if you open, you must close, -- and that there are no numeric indicators where we have numbers or expressions enclosed in grouping symbols. When you're done, come back and check your work.

Great. Activity 3B answer key gives you the opportunity on slide 10 to check your work. Ensure that you have brailled each problem correctly using your grouping symbols.

Slide 11 introduces you to what we call superscripts and baseline indicators. When we have a mathematical expression, such as 10 squared or 10 to the second power, the 10 is at the baseline. And that little 2 is above the baseline. So in braille, to tell the reader that we're going above the baseline, we use level indicators. And the first one we're going to talk about, that students start to learn in 5th grade, is the superscript indicator, that they're going to use in exponents.

We sometimes need to come back down to baseline to continue on with the mathematical expression. So to get ourselves down to baseline, we use the baseline indicator, dot 5. So the superscript indicator takes us up in the air, -- dots 4-5 And the baseline indicator, dot 5 brings us down, if we have a mathematical expression continuing.

So let's first talk a little bit about exponents, as an exponent here on slide 12. So the exponent is telling you how many times you're going to multiply the number by itself. Students begin to work on this in 5th grade. In print, that exponent is that tiny little number up above and to the right. So in my example here, I have 3 squared. 3 is the base number. And the exponent is the 2.

So how am I going to actually braille this? Take a look. First, I'm going to start out by brailing my numeric indicator, 3. Then that superscript indicator-- dots 4-5 -- takes me above the baseline. Well, what's above the baseline? My 2. So it's numeric indicator, 3, dots 4-5, 2. I don't need a second numeric indicator in front of that 2, because the braille reader already knows I'm in math.

It's important that you use the proper terminology with your student, and you use the terminology that their math instructor is using. So this 3 squared could be called many things. It could be 3 to the power of 2, 3 to the second power, -- or as I like to call it, 3 squared. So you need to be familiar with these terms, and so does your student.

Let's go on to slide 13 and look at some examples. Now, you'll notice that each of my examples here, -- I've got five of them, -- are followed by a space. And spaces are magical when it comes to superscripts, because they stop that superscript, -- or in this case, the exponent.

So my first example is 7 to the second power, numeric indicator, 7, that superscript indicator, -- dots 4-5 -- and then my 2. Then I've got 5 to the third power, numeric indicator, 5, superscript indicator, dots 4-5, 3. I've got 8 squared. Numeric indicator, 8, my superscript indicator dots 4-5, and then my 2.

2 to the fourth, I bet you you know how to do this. Numeric indicator, 2, up we go with that superscript indicator, -- dots 4-5, -- and then my 4.

And finally, 10 to the power of 2. Numeric indicator, 10, up in the air I go with my dots 4-5. So I'm leaving baseline to put my 2. Now, these exponents are mathematical. So that means that if I'm in directions or a word problem or an explanation, and we come along to an exponent, I need to make sure that I'm in Nemeth Code.

So I have a word problem here. And I want to point out that this word problem is formatted like a paragraph, because it is not numbered. Is 5 to the third equal to 3 times 5, 5 times 5 times 5, 3 times 3 times 3 times 3 times 3, or 3 to the fifth question mark? So I'm going to start out in UEB, "Is." Now, 5 to the third. Going to open up Nemeth, -- dots 4-5-6, 1-4-6, space, my 5, my superscript indicator, -- dots 4-5, 3, -- space. I'm going to close Nemeth, 4-4-6, 1-5-6, Then I have "equal to."

Again, I'm going to open up Nemeth. I'm going to do 3 times 5, comma, 5 times 5 times 5, comma, 3 times 3 times 3 times 3 times 3, comma. Here, I chose to use my one-word switch indicator dot 6 dot 3 for "or," and now I've got 3 to the fifth. So numeric indicator, 3, my superscript indicator, -- dots 4-5, 5, -- space. I'm going to put that Nemeth terminator, -- 4-5-6, 1-5-6, -- and then the question mark.

So in both of these instances, 5 to the third and 3 to the fifth in this word problem, I stopped my exponent because it was followed by a space. Let's go on to slide 14 and take a look at how I actually use this baseline indicator, which is dot 5, -- because I'm in a mathematical expression, and I'm not following my exponent with a space. Instead, I'm following with something mathematical that's on the baseline. So look at my first example, -- 5 to the fourth plus 7. So of course I start out with a numeric indicator, 5. Now, I need to do my exponent, -- dots 4-5, 4.

I'm up in the air. I'm above baseline with that 5 to the fourth. But look at that plus 7. It's at baseline. It's right there with the 5, at that same level. So I have to come down. And I do that with my dot 5, immediately following the 5 to the fourth, and then plus 7.

Take a look at the next one, -- 2 to the fifth minus 3 squared equals question mark. So I do my 2 to the fifth, numeric indicator, 2, superscript indicator dots 4-5, 5, my baseline indicator, -- so I can do my minus sign, -- and then 3 to the second.

Wait. You're saying wait, you're supposed to have a baseline indicator there, narrator. No, I'm not. Because look, that 3 to the second is followed by a space. So that stops my exponent. So stop the exponent with that space, equals. And then question mark, remember, is represented by our general-omission symbol.

So there's two ways I can stop my exponent,-- either with a baseline indicator, because there's something mathematical that comes next, or a space. Let's look at the third example. This is a tough one, but it's really not as tough as it looks. We're just going to follow the inference.

So we have open parentheses, 8 squared plus 6 squared, closed parentheses, minus, open parentheses, 4 to the third plus 6 squared, closed parentheses. So I'm going to start out with my open parentheses, my 8. I'm going to do my superscript indicator, 2, my dot 5 to return me to baseline, -- my baseline indicators, because I have a plus coming next, -- 6, superscript indicator, 2, -- now, it's very important.

I need to put my dot 5 to return to baseline for that closing parentheses, -- minus, open parentheses, 4, superscript indicator, 3, or 4 to the third, -- returning to baseline for my plus, 6 squared. And then I need to put my dot 5, to return to baseline for that closing parentheses.

Let's look at the last example here on slide 14. Open parentheses, 4 squared, closed parentheses. We're going to take that to the third power. Open parentheses, 5, closed parentheses. And we're going to take that to the fourth power.

My job is to just follow the imprint, and to pay attention to my exponents, to see if they're followed by a space, -- which means they're finished, -- or if I have to return to baseline for what

comes next mathematically. So here I'm opening parentheses, 4, superscript indicator, 2. Then I'm going to do my dot 5 for baseline return, then my closed parentheses. Then I'm going to do my superscript indicator, 3.

And then I'm going to return to baseline with my dot 5. I'm going to open up my next parentheses, do 5, close it. Then I'm going to do my superscript indicator, 4. And I am done, because what comes next is a space.

Let's look at slide 15, which puts you to work. You need to transcribe the following problems in Activity 3C. When you're done, please come back.

Okay, Slide 16 has the answers to Activity 3C. Did you get all your exponents in the right place? I hope so.

Slide 17 talks about the degree sign, which students start to use in 2nd grade in science classes. They start to learn about temperatures. Now technically, the degree sign uses the hollow dot, which takes two cells to write, -- 4-6, 1-6. But when we're talking about temperature that hollow dot is above baseline, isn't it? So we actually use dots 4-5, our superscript indicator, to elevate that hollow dot.

Now, I would not say to a 2nd grader, hey, we're learning superscripts. Instead, we typically teach that 2nd grader that it takes three cells to write a degree sign, -- dots 4-5, 4-6, 1-6.

So I have two examples for you. I have 70 degrees. So numeric indicator, 70, my superscript indicator, which is dots 4-5, my hollow dot, which is 4-6, 1-6. And then 15 degrees, same way I laid out, -- numeric indicator 15, dots 4-5, 4-6, 1-6. So that's how I write a degree sign, is three cells, -- 4-5, in the first, 4-6 in the second, 1-6 in the third.

Now, on slide 18, we talk about temperatures. And that's what we're doing here in the younger grades,-- this is 2nd to 5th grade, -- is Fahrenheit and Celsius. Now, we often abbreviate Fahrenheit and Celsius as "F" for Fahrenheit and "C" for Celsius. Sometimes there is a period with our Fahrenheit and Celsius abbreviations and sometimes they're not. So we're going to follow the imprint.

When I have the abbreviations, -- let's say "F" for Fahrenheit, -- and it is followed by some text, I need to make sure that I include that "F" within my Nemeth Code indicators. In other words, these abbreviations are considered math.

Now, when an abbreviation ends a sentence, -- and I'll show you this on the next slide, -- we're going to say, if that abbreviation has a period, we're going to make that period punctuation, -- rather than going, gosh, is it part of the "F," period for Fahrenheit, or is it the end of the sentence? We're going to say, if it's at the end, it's at the end of the sentence.

So let's take a look first at how to braille 32 degrees Fahrenheit with that "F," period. So numeric indicator, 32, my degree sign, which is 4-5, 4-6, 1-6 space. And then my "F" has a period. So it's capital, "F," period.

Now, when I have 100 degrees C, I'm going to do a numeric indicator, 100, my degree sign, 4-5, 4-6, 1-6, space. I'm going to do dots 5-6, which we think of in UEB as the grade-1 indicator, and then dot 6, "C."

We actually have another name for that dots 5-6 in Nemeth Code. And we'll talk about that in a later lesson. But for right now, we don't want the braille reader to think it's 100 degrees C, so we are going to let them know that, hey, this is a single capital letter. So it's dots 5-6, capital indicator, C.

Okay, slide 19 lets us really talk about, hey, how do I do, when I have temperatures that have periods, is there abbreviation? And we're at the end of a sentence. So let's take a look. This is problem 2. "The pool will open when the temperature rises to 85 degrees Fahrenheit." That's "F," period. "This week the daily high is 72 degrees Fahrenheit." And then, "How much must the temperature rise before the pool opens?"

So we have two statements, -- two sentences that each end with an "F," period being part of the temperature reading. So I'm going to start out in UEB, -- 2, period. The pool will open when the temperature rises to... Then going to open Nemeth. That's 4-5-6, 4-5-6, 1-4-6, 85 degrees.

So my numeric indicator, 85, my degree sign, 4-5, 4-6, 1-6, space. And then I've got my "F," period. It's capitalized. So dots 5-6, capital, "F." Close Nemeth with my Nemeth terminator, -- 4-5-6, 1-5-6, -- and then my period. So that period is closing the sentence. It's punctuation.

Okay. Then we have, "This week the daily high is 72 degrees Fahrenheit." So same process-- opening Nemeth with my Nemeth opening indicator, space, 72, my degrees sign, 4-5, 4-6, 1-6, space, dots 5-6 capital sign, "F," -- so that we know that we're not doing "From," that we're doing capital "F," -- space, Nemeth terminator, -- 4-5-6, 1-5-6, -- and then my period.

And then I continue on in UEB with the rest of the word problem. "How much must the temperature rise before the pool opens?"

All right, let me give you another example of a word problem that uses temperature. So this is problem 18. "Max read 58 degrees F on the meat thermometer at 10:00 a.m." So that "F" stands for Fahrenheit. It doesn't have a period. So "Max read 58 degrees Fahrenheit on the thermometer at 10:00 a.m. Sam read 62 degrees Fahrenheit on the thermometer at 1:15 p.m. What is the difference between the two temperature readings?"

So both of these temperature readings just have the capital "F." There's no period associated with them. So I start out in UEB, -- 18, -- with "Max read." Open Nemeth, -- 58, my degree sign, dot 4-5, 4-6, 1-6. And then I've got a capital "F." So just dots 5-6 -- to tell the braille reader, hey, it's a letter, -- dot 6, F, close Nemeth. And then I continue on, "on the thermometer at 10:00 a.m."

So I'm in UEB. So I do my 10:00 a.m. in UEB numbers, -- a, period, m, period. Then I continue on, -- "Sam read 62 degrees." So I'm going to open Nemeth with my opening Nemeth indicator, numeric indicator, 62, my degree sign, 4-5, 4-6, 1-6, space, English letter indicator, or grade-1 indicator, dots 5-6, capital "F," and then Nemeth terminator. And I continue on with the rest of

the problem, -- "on the thermometer at 1:15 p.m. What is the difference between the two temperature readings?"

I want to point out to you that it's important that whenever possible you keep the opening and the terminating Nemeth indicator on the same line as the math that they are accompanying.

It's now your turn. We're going to have you do Activity 3D, on slide 21. When you're ready, please come back.

And slide 22 has the answer key for Activity 3D. Did you get all your symbols in the right spot, so that you're opening and closing Nemeth properly? And you're ready to go. Thank you so much for taking part in Lesson 3.