MGSE5.NBT.7 Multiplication and Division Video Transcript

00:01
[Opening Music]

00:17
In this video, we will deconstruct standard NBT.7 of the grade 5 Georgia standards of excellence for mathematics. This standard represents the operations of addition, subtraction, multiplication, and division using decimals to hundredths. This video will specifically focus on using multiplication and division strategies to compute with decimals.

00:38
Standard NBT.7 expects students to use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between multiplication and division to solve problems. The students should relate the strategy to a written method and be able to explain the reasoning behind the chosen strategy.

00:58
NBT.7 builds on the work from 4th grade where students are introduced to decimals. Students are expected to compare decimals using concrete models to build an understanding of their size. In 5th grade, students begin adding, subtracting, multiplying and dividing decimals. This standard requires students to extend the models and strategies they developed for whole numbers in grades 1-4 to decimal values. It is important to note that students are not required to use the traditional algorithm to compute with decimals in fifth grade. It is not until 6th grade when students are required to fluently add, subtract, multiply, and divide multi-digit decimals using the traditional algorithm for each operation.

01:44
Division problems in grade 5 should NOT require use of the traditional algorithm or annexing zeros. In fact, fifth grade students should be able to solve any decimal division problem with one of the following three strategies.

02:00
1) Using the relationship between multiplication and division. For, example, $36.4 \div 5.2$ is the same as $5.2 \times n = 36.4$. Repeated subtraction and number lines also fall under this category.

02:20

2) Ignoring decimals and using number sense and estimation to place the decimal point in the quotient. For example, 148.8 ÷ 62. Ignoring the decimals, we have 1,488 ÷ 62 which yields a quotient of 24. But 24 doesn't make sense, using estimation, because the dividend, 148.8 is between 2 and 3 times larger than the divisor, 62. So, the quotient must be a value between 2 and 3. So, the decimal goes between the 2 and the 4, for 2.4.

02:56

3) Multiplying the dividend and divisor by the same factor or same power of ten to eliminate decimals and then using a strategy. For example, 9.3 ÷ 0.31. We can multiply the dividend and the divisor by 100, which gives us an equivalent expression: 930 ÷ 31, which is 30.

03:19

When using decimal division problems from online vendors, worksheet generators, or textbooks, it is important to use discretion to make sure that math content is aligned to Georgia Standards.

03:31

Pause the video here and discuss with your colleagues which of these four problems does not belong in fifth grade math.

These three problems can be solved with concrete models and/or strategies based on prior knowledge with whole number arithmetic.

However, this problem: 5.83 ÷ 5.5 is the only one that requires annexing zeros in the dividend to generate a quotient. Note: This problem was found in a fifth-grade math lesson from a very popular online marketplace.

04:04

Broken Calculator is a number sense routine that encourages students to abandon paper and pencil computation methods and instead focus purely on reasoning and estimating.

04:13

Start by providing a division situation or expression to students and tell them that the division key on the calculator is broken. Then, have them take turns guessing at the quotient. Each time a guess is given, it is recorded and evaluated in order to generate the next best guess. The objective is to arrive at the correct quotient in the least number of guesses possible. Be sure to probe students to reason about their guesses or use question frames to teach students to internalize the habit of reasoning out loud. Watch as this student tries to guess the quotient to this problem.

04:43 (Video)
Student: Well, since the division key is broken, I have to use multiplication. So… and it equals… 32.48.
Teacher: Is that too high, or too low?
Student: Too low.
Teacher: Ok, so how are you going to use that to help you make your next guess?
Student: Since it's too low… that means it has to be higher than 5.6.
[During the elapsed time, student makes and records two more guesses.]
Student: Ok, so it's 6 x 5.8, which equals… 34.8… which is too high.
[During the elapsed time, student makes and records one more guess.]
Student: 5.95… you get 34.51

05:56
In second and third grade, students are introduced to whole number multiplication and division. Through their experiences, many children generalize that when quantities are multiplied the product is always larger than either factor. Students also generalize that when a quantity is divided into equal groups the quotient will always be less than the dividend.

06:19
As students progress through their learning, they should think critically about what happens when a decimal less than one is multiplied by a whole number. For example, when multiplying 0.8 x 6, students should think that 0.8 is close to one and 1 x 6 = 6, so the product will be close to 6. However, 1 is more than 0.8, so the actual product will be less than six because 0.8 is less than 1. Since 8 x 6 = 48, the product can be divided by 10^1 to get 4.8, which is close to the estimate of six.

07:00
In this grade 5 Georgia standards of excellence for mathematics framework culminating task, students are instructed to determine the best field trip for their class to attend. Students are required to multiply to find the total cost of admissions and mileage. Next, students must add those two amounts to find the total cost of the trip.

07:21
The task gives some other important information for students to reason through to find the total cost of the trip. Because the school will pay for the first $200, the students must use prior knowledge of subtracting decimals. Once the total amount is calculated, students must then divide to find out how much each individual student will pay.

07:44
To clarify misconceptions about multiplying decimals, students should estimate to find a range for their product. This will help in placing the decimal in the correct place once the multiplying is complete. Watch as this student explains their reasoning for multiplying.

08:00 (Video)
Teacher: Ok, so I see you have three different multiplication problems here.
Student: Mmm-hmm.
Teacher: Can you explain to me what they are?
Student: Alright. So, this one is our "too-low." Since, umm… $6.75… we had to round down to make our "too-low." So, we did 30 x 6.
Teacher: Mmm-hmm.
Student: That got to $180.
Teacher: Ok
Student: That's going to be our "too-low."
Teacher: Ok… Alright.
Student: Then our "too-high" we have to do 30 x 7 because we have to round up.
Teacher: Ok.
Student: So, that got us $210. So that's gonna be our "too-high."
Teacher: Gotcha…
Student: So, our answer, overall, is going to be in-between these two.
Teacher: Ok, good!
Student: And this is the overall answer.
Teacher: Ok.
Student: We did $6.75 x 30.
Teacher: Ok.
Student: And that got us $202.50.

08:45
Because this is the first experience students have with dividing decimals, students can first examine the cases of dividing by 0.1 and 0.01 to see that the quotient becomes 10 times or 100 times as large as the dividend. For example, students can view 5 ÷ 0.1 as asking how many tenths are in 5. Because it takes 10 tenths to make 1, it takes 5 times as many tenths to make 5, so 5 ÷ 0.1 = 5 x 10 = 50. Or students could note that 5 is 50 tenths, so asking how many tenths are in 5 is the same as asking how many tenths are in 50 tenths, which is 50. In other words, 5 ÷ 0.1 is the same as 50 ÷ 1. So, dividing by 0.1 moves the number 5 one place to the left, the quotient is ten times as big as the dividend.

09:56
Using money as a manipulative can also be helpful in students' understanding of the decimal. It is imperative for the teacher to give students problems with a context to model the process of division. Students were told that some friends went to eat pizza and they wanted to share the total cost of the bill. These students determined that division would be used to solve the problem. Next, the teacher read that some friends were going to share the $19.80 bill. Students replaced the variable "m" with $19.80. Finally, the teacher read that the five friends went to eat pizza and their total bill was $19.80. They wanted to share the bill evenly. How

much will each person pay? Students were able to count out the money and share it evenly with the five friends.

10:51
As the students divide the money, the teacher should relate their movements to the steps in the partial quotients. When students are sharing the dollars, the teacher needs to make the connection to whole numbers, dimes to tenths, and pennies to hundredths. Writing these amounts using the decimal notation will help students understand the values of the digits being recorded in the division problem.

11:17
When students divide decimals, they can also use estimating as a strategy to ensure the decimal gets placed in the correct position. When students round the decimals to the lowest and highest whole number values, it is important to ensure students are rounding the dividend to multiples of the divisor. For the field trip task, this student chose 150 and 180 because they are both multiples of 30. This allowed for the student to see that the quotient must fall between 5 and 6.

11:48
For additional support and resources, please visit Georgiastandards.org where you can find additional tasks, intervention material, and more.

11:57
[Closing Music]