

Math: Grade 3, Lesson 20, Multiplication Facts and Strategies

Lesson Focus: Use strategies to multiply with the factor 9.

Practice Focus: Students will focus on practicing using strategies to multiply with 9.

Objective: Students will use strategies to multiply with 9.

Key Vocabulary: factor, product, pattern, distributive property

TN Standards: 3.OA.C.7

Teacher Materials:

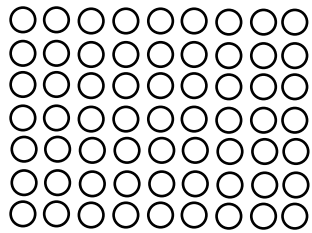
- Paper, pencil, and dry erase board/marker
- Student Practice Packet

Student Materials:

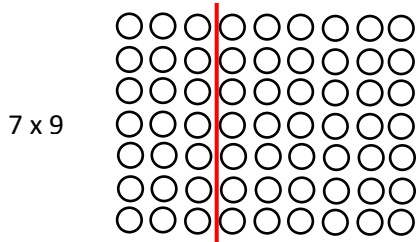
- Paper and a pencil, and a surface to write on

Teacher Do	Student Do
<p><u>Opening</u> (1 min)</p> <p>Hello! Welcome to Tennessee's At Home Learning Series for math! Today's lesson is for all our 3rd graders out there, though all children are welcome to tune in. This lesson is the twentieth in our series.</p> <p>My name is ____ and I'm a ____ grade teacher in Tennessee schools! I'm so excited to be your teacher for this lesson! Welcome to my virtual classroom!</p> <p>If you didn't see our previous lesson, you can find it on the TN Department of Education's website at www.tn.gov/education. You can still tune in to today's lesson if you haven't see any of our others. But, it might be more fun if you first go back and watch our other lessons since we'll be talking about things we learned previously.</p> <p>Today we will be learning about using strategies to multiply with 9 in mathematics! Before we get started, to participate fully in our lesson today, you will need:</p> <ul style="list-style-type: none">• Paper and a pencil, and a surface to write on• The student packet for Math, Grade 3, Lesson 20 which can be found at www.tn.gov/education. <p>Ok, let's begin!</p>	<p>Students get materials ready for the lesson.</p>
<p><u>Intro</u> (5 min)</p> <p>Since we are practicing multiplying with 9 in this lesson, let's begin by creating a list of our nines facts so we can look for patterns.</p>	

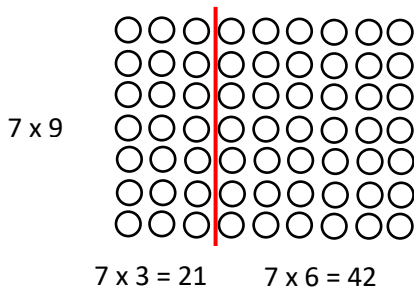
<p>On your paper, write the list with me. We'll begin with $1 \times 9 = 9$ and end with $9 \times 9 = 81$. [Teacher creates chart below and says each fact as she writes it.]</p> <p>$1 \times 9 = 9$ $2 \times 9 = 18$ $3 \times 9 = 27$ $4 \times 9 = 36$ $5 \times 9 = 45$ $6 \times 9 = 54$ $7 \times 9 = 63$ $8 \times 9 = 72$ $9 \times 9 = 81$</p> <p>We knew how to create this list because we understand that we're adding an additional group of nine each time. We started with $1 \times 9 = 9$, or one group of nine equals nine. Then we knew $2 \times 9 = 18$ because two groups of nine equals nine plus nine. To complete the list, we kept adding a group of nine.</p> <p>Now, take a moment to look for patterns in our list of nines facts. [Pause.]</p> <p>What do you notice about the tens digit in the products in this list? [Pause.] When we look down the place value column for the tens place, the digits or numerals are in order. Remember that for $1 \times 9 = 9$, we can think of it as having zero tens so it also follows this pattern we see.</p> <p>What do you notice about the ones digit in the products in this list? [Pause.] The digits or numerals are in decreasing order from 9 to 1.</p> <p>What do you notice about the sum of the digits in each product in this list? [Pause.] The sum of the digits in each of the products is 9.</p> <p>What do you notice about the factor that's not 9? [Pause.] The numeral in the tens place of the product is always one less than the number being multiplied by 9.</p> <p>Great job noticing patterns with the nines facts. Recognizing patterns is a good math habit and helps us develop our</p>	<p>Students make the list of nines facts on their paper.</p> <p>Students look for patterns with the tens digit in the products.</p> <p>Students notice the digits in the ones place of the products are in increasing order.</p> <p>Students notice the sum of the digits of the products is 8.</p> <p>Students look at the factor that isn't 9 for a pattern.</p>
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<p>number sense as we continue to build fluency with multiplication.</p>	
<p><u>Teacher Model</u> (10 min)</p> <p>Objective 1: Teacher modeling using the distributive property with addition to multiply with 9.</p> <p>One of the strategies we've used to find products is the distributive property. This is a strategy we'll use today to multiply with 9. Let's look at a problem together that'll we'll solve using the distributive property.</p> <p>Follow along as I read the problem aloud. [Teacher displays problem and reads aloud.]</p> <p>Olivia's class is studying the solar system. Seven students are making models of the solar system. Each model has 9 spheres (eight for the planets and one for Pluto, a dwarf planet). How many spheres do the 7 students need for all the models? Find 7×9.</p> <p>Let's make sense of the problem. What are we asked to find out? [Pause.] We are asked to find the total number of spheres needed for all the students. This is our product.</p> <p>How many students are making the models? Show me with your fingers. [Pause.] Yes, seven students are making the models. This is our factor that represents the number of groups.</p> <p>And we know that each student needs 9 spheres. This is our factor that represents how many in each group.</p> <p>We've made sense of the problem. We know we are finding the product for 7×9. Let's begin by drawing a 7×9 array. Remember, a 7 by 9 array means we have 7 rows of 9. Use dots to draw one on your paper as I draw mine. [Teacher draws array like image below.]</p> <div style="display: flex; align-items: center; margin-top: 20px;"> <div style="margin-right: 10px;">7×9</div>  </div>	<p>Objective 1: Students will be reviewing using the distributive property with addition to find products of nines facts. They will practice the strategy with and without a drawing.</p> <p>Students track the problem as teacher reads it aloud.</p> <p>Students think about what the problem is asking them to find.</p> <p>Students show 7 fingers to indicate there are 7 students.</p> <p>Students use dots to draw a quick array for 7×9.</p>

Now let's use the distributive property to break apart our 7 x 9 array into smaller parts. Remember, we can draw either a vertical line or a horizontal line to break apart the array. I want to break apart the factor 9 into smaller parts so I'm going to draw a vertical line. This will cut apart the number of counters in each row. Draw your line the same way. [Teacher draws line like image below.]



On your paper, record the multiplication equations that describe the smaller arrays. [Pause.]



Give me a thumbs up if you recorded $7 \times 3 = 21$ and $7 \times 6 = 42$. Great! Did you notice that these two equations have the doubles relationship? That is, the factor 6 in the 7×6 is double the factor 3 in 7×3 , and the product 42 is double the product 21. Knowing this relationship is why I broke apart the array like this.

Okay, we've broken apart our whole into two parts. Now let's do the math to find the product of 7×9 . Complete this equation on your paper. $7 \times 9 = \underline{\quad} + \underline{\quad} = \underline{\quad}$. [Pause.]

Give me a thumbs up if your completed equation is $7 \times 9 = 21 + 42 = 63$. Great work! The product of $7 \times 9 = 63$. The total number of spheres needed for all students is 63.

[Teacher does think aloud to help students use strategy without drawing an array.]

I bet many of you can use this strategy now without having to draw an array. Listen to my think aloud as I use the strategy without drawing an array.

Students draw a line on their array to break it apart like the teacher's work.

Students record the parts with the equations $7 \times 3 = 21$ and $7 \times 6 = 42$.

Students check their equations.

Students finish out the strategy and complete the equation $7 \times 9 = 21 + 42 = 63$.

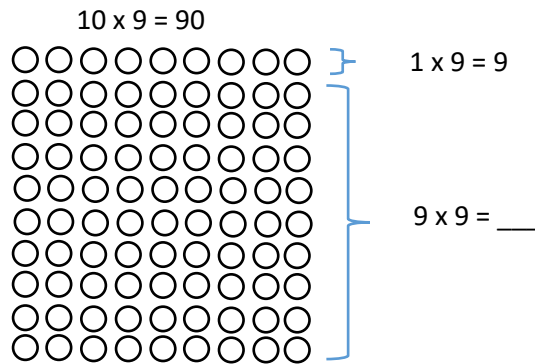
Students give a thumbs up for the correct equation.

Students listen to teacher use the distributive property without having a drawing of an array.

<p>I need to find the product of $7 \times 9 = \underline{\quad}$. [Teacher displays $7 \times 9 = \underline{\quad}$.] This is an unknown fact for me so I'm going to break apart one of the factors so I can use two known facts to help me. I'm going to break apart the factor 9 so I can think about having fewer objects in each row. The parts I choose must add up to 9. I'm confident with my 3s facts and my 6s facts so I'll break apart my problem this way. [Teacher records $7 \times 9 = 7 \times (3 + 6)$.]</p> <p>$7 \times 9 = 7 \times (3 + 6)$. Record this equation on your paper too. The right side of this equation describes that I am breaking apart the factor 9 into factors of 3 and 6. This represents drawing a vertical line on the 7×9 array to break apart the 9 objects in each row.</p> <p>So my smaller parts still have 7 rows, or the factor 7. But instead of 9 objects in each row, one of the smaller parts has 3 in each row and the other part has 6 in each row. I can show the distribution with this equation. $7 \times 9 = (7 \times 3) + (7 \times 6)$. Record the equation on your paper, too. [Pause.] The right side of this equation shows how I'm distributing the whole into the two parts. These are the two smaller arrays.</p> <p>Now we just need to do the math! On your paper, complete this equation $7 \times 9 = \underline{\quad} + \underline{\quad} = \underline{\quad}$. [Pause.]</p> <p>Give yourself a pat on the back for completing the equation like this, $7 \times 9 = 21 + 42 = 63$. We just used the distributive property to find $7 \times 9 = 63$.</p> <p>Objective 2: Teacher modeling using the distributive property with subtraction to multiply with 9.</p> <p>So far when we've used the distributive property to solve multiplication problems, we've paired it with addition in order to find the whole. We can also use the distributive property with subtraction! When we pair the strategy with subtraction, we use a known fact for the whole and the product we're trying to find is one of the smaller parts. This strategy is effective to learn nines facts because we can use our known 10s facts to help us.</p> <p>Let's say I need to find the product of 9×9. I don't recall the product of 9×9 without some thinking, but I do instantly</p>	<p>Students record equation to show how the array is being broken apart.</p> <p>Students record the equation that shows the distribution.</p> <p>Students complete the equation $7 \times 9 = 21 + 42 = 63$.</p> <p>Objective #2: Students will be reviewing using the distributive property with subtraction to find products of nines facts. This will support students developing multiplication fact fluency.</p> <p>Students look at the array for 10×9.</p>
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recall that $10 \times 9 = 90$. So how can this help us? Look at the 10×9 array. [Teacher shows image of array below.]

10×9 , or 10 rows of 9, represents the whole array. On the right side, I've labeled the part I need to find which is 9×9 . I've also labeled the other part which is 1×9 in this case.



Now we're ready to do the math. Write these equations on your paper as I talk through them.

$9 \times 9 = (10 - 1) \times 9$. This equation represents that we're thinking about the 9 rows as one of the parts when 10 is the whole.

$9 \times 9 = (10 \times 9) - (1 \times 9)$. This equation represents the distribution of the rows as a whole and parts.

Now try completing the equation $9 \times 9 = ___ + ___ = ___$ on your own. [Pause.]

Give yourself some applause for solving the equation $9 \times 9 = 90 - 9 = 81$.

Tying the learning together: Students understand the distributive property can be used with both addition and subtraction to find products.

Let's think through another problem where we'll use the distributive property with subtraction to find the product when one factor is 9.

Let's find the product of 4×9 .

We can think of the factor 9 as the difference of 10 and 1. So $4 \times 9 = 4 \times (10 - 1)$. Record this equation on your paper. [Pause.]

Students record the equation $9 \times 9 = (10 - 1) \times 9$.

Students record the equation $9 \times 9 = (10 \times 9) - (1 \times 9)$.

Students do the calculations to complete the equation $9 \times 9 = 90 - 9 = 81$.

Tying the learning together: Students understand the distributive property can be used with both addition and subtraction to find products.

Students record $4 \times 9 = 4 \times (10 - 1)$.

<p>Now we need to describe the distribution. Say out loud what the distribution is. [Pause.] Give yourself a thumbs up if you said something like the 4 is distributed across the expression $(10 - 1)$. Continue your equation so it now reads $4 \times 9 = 4 \times (10 - 1) = (4 \times 10) - (4 \times 1) = \underline{\quad} - \underline{\quad} = \underline{\quad}$. Great!</p> <p>Now do the math to complete the equation. [Pause.] Give yourself some applause for completing the equation as $4 \times 9 = 4 \times (10 - 1) = (4 \times 10) - (4 \times 1) = 40 - 4 = 36$.</p> <p>Great job! I hope you are feeling very confident using the distributive property to find products. We'll now do some guided practice problems.</p>	<p>Students verbalize that the distribution is four times the expression $(10 - 1)$.</p> <p>Students do the calculations to complete the equation $4 \times 9 = 40 - 4 = 36$.</p>
<p><u>Guided Practice (10 min)</u></p> <p>[I do.] I'll do the first practice problem. [Teacher reads the problem out loud and does a think aloud as she solves it.]</p> <p>Use the distributive property to find the product for 8×9.</p> <p>When I see the factor 8, I think of double 4s. So I'm going to use the distributive property with addition to break apart the 8×9 array into two 4×9 arrays.</p> <p>$8 \times 9 = (4 + 4) \times 9 = (4 \times 9) + (4 \times 9)$. So I've now broken apart the whole array into two smaller arrays. Now I will do the math to complete the equation $8 \times 9 = \underline{\quad} + \underline{\quad} = \underline{\quad}$. On your paper, record this equation and do the calculations. [Pause.]</p> <p>$8 \times 9 = 36 + 36 = 72$.</p> <p>I also could have used the distributive property with subtraction to find 8×9. I'll think about the factor 9 as the difference of 10 and 1. So $8 \times 9 = 8 \times (10 - 1)$. Next, I need to show the distribution. Now my equation reads $8 \times 9 = 8 \times (10 - 1) = 8 \times 9 = 8 \times (10 - 1) = (8 \times 10) - (8 \times 1)$. Do the math with me! Record this final equation on your paper as I talk through it.</p>	<p>Students listen to teacher's think aloud as she solves 8×9.</p> <p>Students record equation and complete calculations to show $8 \times 9 = 36 + 36 = 72$.</p> <p>Students listen to teacher think aloud about using the distributive property with subtraction.</p> <p>Students record equation and complete calculations to show $8 \times 9 = 80 - 8 = 72$.</p>

<p>$8 \times 9 = 80 - 8 = 72$. The expression $80 - 8$ represents the product of the whole minus the product of the other part. So the difference is the product of the part we were wanting to find, $8 \times 9 = 72$.</p> <p>[We do.]</p> <p>Now let's do this next problem together.</p> <p>Use the distributive property to find the product for 6×9.</p> <p>Let's use the distributive property with addition. We can either break apart the factor 6 or we can break apart the factor 9. This time let's break apart the 9 into two parts whose sum is 9. Let's use 3 and 6 since they are doubles.</p> <p>On your paper, record $6 \times 9 = 6 \times (3 + 6) = (__ \times __) + (__ \times __)$.</p> <p>[Pause.]</p> <p>The expression $6 \times (3 + 6)$ describes that we're breaking apart the 9 into the smaller parts of 3 and 6. Go ahead and complete the next part of the equation that describes the distribution. [Pause.]</p> <p>Give me a thumbs up if you recorded $6 \times 9 = 6 \times (3 + 6) = (6 \times 3) + (6 \times 6)$. Very good!</p> <p>Now we're ready to calculate the sum of the products of the parts to find the product of the whole. Do this now on your paper to complete the equation $6 \times 9 = __ + __ = __$.</p> <p>[Pause.]</p> <p>Give yourself a high five if your completed equation looks like mine. $6 \times 9 = 18 + 36 = 54$.</p> <p>Let's see what solving 6×9 looks like using the distributive property with subtraction.</p> <p>We can think about the factor 9 as the difference of 10 and 1. So $6 \times 9 = 6 \times (10 - 1)$.</p> <p>Next, we need to show the distribution.</p> <p>Complete this equation to show the distribution.</p> <p>$6 \times 9 = 6 \times (10 - 1) = (__ \times __) - (__ \times __)$.</p> <p>Check to see that you have $(6 \times 10) - (6 \times 1)$ to show the distribution. Great!</p> <p>Now do the calculations and show your work in the equation $6 \times 9 = __ - __ = __$.</p> <p>Give me a thumbs up if your equation is $6 \times 9 = 60 - 6 = 54$.</p>	<p>Students work through a problem with the teacher.</p> <p>Students complete the equation to show the whole array and its parts. $6 \times 9 = (6 \times 3) + (6 \times 6)$.</p> <p>Students give a thumbs up to indicate correct work.</p> <p>Students complete equation to get $6 \times 9 = 18 + 36 = 54$.</p> <p>Students check work.</p> <p>Students solve with the teacher using subtraction.</p> <p>Students write the equation to show the distribution $(6 \times 10) - (6 \times 1)$.</p> <p>Students do the calculations to get $6 \times 9 = 60 - 6 = 54$.</p>
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<p>Awesome!</p> <p>[You do.]</p> <p>Now you try one by yourself!</p> <p>Use the distributive property to find the product for 3×9.</p> <p>[Pause.]</p> <p>Give me a thumbs up if you found $3 \times 9 = 27$. Fabulous!</p> <p>If you used the distributive property with addition, your final equation should look similar to this: $3 \times 9 = 9 + 18 = 27$. You may have a different expression than $9 + 18$ depending on how you broke apart the array. But the sum should still be 27.</p> <p>If you used the distributive property with subtraction, your final equation should look similar to this: $3 \times 9 = 30 - 3 = 27$.</p> <p>Great job!</p> <p>Additional Problems (if needed):</p> <p>There are 9 positions on the softball team. Three people are trying out for each position. How many people are trying out?</p> <p>Uranus has 27 moons. What multiplication fact with 9 can be used to find the number of moons Uranus has? Describe how you can find the fact.</p>	<p>Students solves problem alone.</p> <p>Students check to see they found $3 \times 9 = 27$.</p> <p>Students listen to explanation for using strategy with addition.</p> <p>Students listen to explanation for using strategy with subtraction.</p>
<p><u>Independent Practice</u> (10 min)</p> <p>Great work, students! Today, we reviewed using the distributive property with addition and with subtraction to multiply by 9. You sure did a great job! I will show you the independent practice problems now, or you can find them in the student practice for this lesson posted on our website, www.tn.gov/education. [Teacher shows student practice page under document camera or camera zooms in on student practice page.]</p> <p>Good luck and do your best!</p>	<p>Students listen to teacher summarize today's learning and view the independent practice problems.</p>
<p><u>Closing</u> (1 min)</p> <p>Students, I enjoyed practicing strategies to multiply by the factor 9 with you! Thank you for inviting me into your home. I look forward to seeing you in our next lesson in Tennessee's At Home Learning Series! Bye!</p>	