

**Math: Grade 5, Lesson 12, Multiply 2-digit by 2-digit Numbers**

**Lesson Focus:** Multiply 2-digit by 2-digit Numbers

**Practice Focus:** Students will focus on practicing using the area models, standard algorithm, or place value in order to multiply 2-digit by 2-digit numbers.

**Objective:** Students will use various strategies to multiply with a focus on 2-digit by 2-digit numbers.

**Key Vocabulary:** partial products, standard algorithm

**TN Standards:** 5.NBT.B.5

**Teacher Materials:**

- Board/marker
- Student Practice Packet

**Student Materials:**

- Paper and a pencil

Teacher Do	Student Do
<p>Opening (1 min)</p> <p><b>Hello! Welcome to Tennessee’s At Home Learning Series for math! Today’s lesson is for all our 5th graders out there, though all children are welcome to tune in. This lesson is the twelfth in our series.</b></p> <p><b>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!</b></p> <p><b>If you didn’t see our previous lesson, you can find it on the TN Department of Education’s website at <a href="http://www.tn.gov/education">www.tn.gov/education</a>. You can still tune in to today’s lesson if you haven’t seen 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.</b></p> <p><b>Today we will be learning about using the standard algorithm and place value in order to multiply 2-digit by 2-digit numbers in mathematics! Before we get started, to participate fully in our lesson today, you will need:</b></p> <ul style="list-style-type: none"><li>• Paper and pencil</li><li>• The student packet for Math, Grade 5, Lesson 12 which can be found at <a href="http://www.tn.gov/education">www.tn.gov/education</a>.</li></ul> <p><b>Ok, let’s begin!</b></p>	<p>Students get materials ready for the lesson.</p>
<p>Intro (5 min.)</p> <p><b>In fourth grade, you most likely learned to multiply 2-digit numbers by 2-digit numbers using an area model that used partial products. Let’s do a quick review. Listen as I read a problem.</b></p>	

[Read the problem aloud.]

**Ms. Silva has 12 weeks to train for a race. Over the course of one week, she plans to run 15 miles. If she continues this training, how many miles will Ms. Silva run before the race?**

**What do we need to do to solve this problem?** [Pause.]

**Yes, we can multiply 12 x 15!**

[Write and say.]

$$\begin{array}{r} 12 \\ \times 15 \\ \hline \end{array}$$

**What is 12 times 15? Where do we begin?** [Pause.]

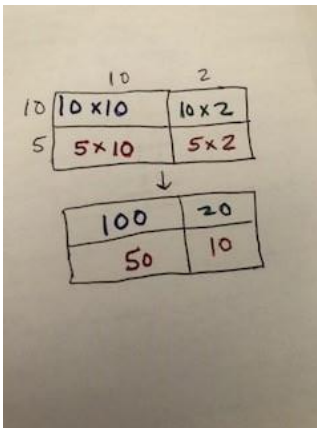
**First, let's draw an area model.** [Draw and explain area model.]

**How can we break apart each factor using place value?**

[Pause.]

**Yes, we could break apart 12 as one 10 and 2 ones or 10+2 and 15 as 1 ten and 5 ones or 10+5.**

**Then, we need to multiply to simplify each expression in the boxes. We will write the numerical answer to each expression in a new box like I have done here.**



**What do the expressions in the smaller rectangles represent?**

[Pause.]

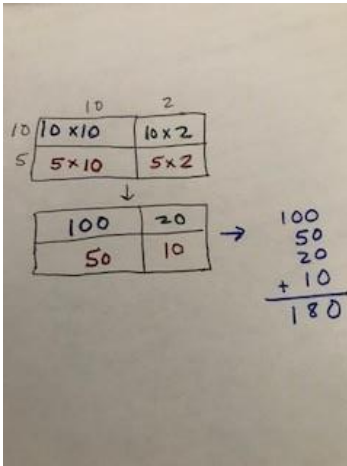
**Yes, they represent our partial products. What is a product?**

**That's right! It's the answer to a multiplication problem. So why are these partial products? Oh...that makes sense.**

**Partial means part and these are each a part of the larger**

**product. Good thinking! Now, what do we do with these partial products?** [Pause.]  
**Yes, we can add the partial products to get our final answer.**  
 [Say and write the partial products like the picture.]

**So,  $100+50+20+10 = 180$**



Teacher Model (10 min.)

Objective 1: Teacher will extend students understanding of 2 digit by 2 digit multiplication to explicitly instruct on how to use partial products to multiply 2-digit numbers by 2-digit numbers. This will serve as a link to connect grade 4 work to the new grade level learning which is using the standard algorithm.

**Let's build on what we just discussed to solve a problem using partial products only without the area model.**

$$\begin{array}{r} 37 \\ \times 24 \\ \hline \end{array}$$

**So, let's begin in the ones place. First, we will multiply 4 times the digit in the ones place for the first factor. What digit is in the ones place?** [Pause.]  
**Yes, the 7. What is 4 times 7 ones?** [Pause.]  
**Yes, 28.** [Write and say.]  
**We will write 28.**

Students will be building off their work multiplication problems to find the product of 2-digit by 2-digit numbers using partial products.

$$\begin{array}{r} 37 \\ \times 24 \\ \hline 28 \end{array}$$

Now we need to multiply the tens.

$4 \times 3$  tens = 12 tens and we know that 12 tens = 120

Now, place the numbers in your problem like I have placed them in mine. Let's keep going! [Continue writing the numbers on the problem.]

$$\begin{array}{r} 37 \\ \times 24 \\ \hline 28 \\ 120 \end{array}$$

Still working with the second factor we need to multiply by number in the tens place. What digit is in the tens place?

That's it...2!

What is 2 tens times 7? [Pause.]

Yes, 14 tens which is 140. [Write and say.]

We will include 140 in our list of partial products.

$$\begin{array}{r} 37 \\ \times 24 \\ \hline 28 \\ 120 \\ 140 \end{array}$$

Now we need to multiply 2 tens by 3 tens.

What is 2 tens time 3 tens? [Pause.]

Yes, 6 tens. [Write and say.]

And 6 tens equals 600.

We will include 600 on our list of partial products!

$$\begin{array}{r} 37 \\ \times 24 \\ \hline 28 \\ 120 \\ 140 \\ + 600 \end{array}$$

Now find the sum of the partial products. The sum is 888.

Hmmmm...That's interesting. The product of a two-digit number by a 2 digit number has 4 partial products here just like we had 4 partial products in our area model.  $2 \times 2 = 4$ !

**Do you think we will always have 4 partial products when multiplying 2-digits by 2-digits? Yes! That's pretty awesome!**

Objective 2: Teacher will explicitly instruct how to use the standard algorithm to multiply 2-digit numbers by 2-digit numbers.

**Now let's move to the standard algorithm. Do you think we will get the same answer? [Pause] Let's see! Let's work the same problem again.**

$$\begin{array}{r} 37 \\ \times 24 \\ \hline \end{array}$$

**Remember when multiplying we work from right to left so that we multiply our smallest numbers first. In our problems that has been what place value? [Pause.] You got it ones! Then we can move to the left to work with 10s, 100s, and even thousands! What did we have to do sometimes as we were multiplying? [Pause.] Yes! We might have to regroup tens, hundreds, or even thousands.**

**So, let's begin in the ones place. We are going to start just like we did with partial products. First, we will multiply 4 times the number in the ones place in our first factor 37.**

**What digit is in the ones place? [Pause.]**

**Yes, the 7. What is 4 times 7? [Pause.]**

**Yes, 28. [Write and say.]**

**We will write the 8 in the ones column. But this is where things are a bit different. We will need to regroup and write the 2 tens over the digit 3 which is also in the tens place.**

[Add the numbers to your problem as you go. You might want to use different colored markers if possible.]

$$\begin{array}{r} 2 \\ 37 \\ \times 24 \\ \hline 8 \end{array}$$

**So, 4 x 7 ones = 28; 28 is 2 tens 8 ones.**

**Now we need to multiply 4 by the tens place. What digit is in the tens place? That's right! 3**

**4x3 tens = 12 tens.**

Students will be applying the standard algorithm strategy to multiply 2-digit numbers by 2-digit numbers.

Plus, we had regrouped earlier. So, we need to add 12 tens + 2 tens = 14 tens or 140. We need to add that to the 8 we already found.  $140 + 8 = 148$

Does your problem look like mine? Let's keep going!

[Continue writing the numbers on the problem. Use different colors if available.]

$$\begin{array}{r} 2 \\ 37 \\ \times 24 \\ \hline 148 \end{array}$$

What do we need to do now? [Pause.]

Yes, we need to multiply by the number in the tens place by 37. What digit is in the tens place? [Pause.]

Yes, a two.

So, what is 2 tens x 7? [Pause.]

Yes, 14 tens which equals 140

We need to regroup the hundred in 140.

$$\begin{array}{r} 1 \\ 2 \\ 37 \\ \times 24 \\ \hline 148 \\ 40 \end{array}$$

Now, we multiply by tens. What is 2 tens x 3 tens? [Pause.]

Yes, 2 tens x 3 tens = 600

So, 600 + the 100 we regrouped = 700.

$700 + 40 = 740$ .

Let's include that in our problem.

[Continue writing the numbers on the problem. Use different colors if available.]

$$\begin{array}{r} 1 \\ 2 \\ 37 \\ \times 24 \\ \hline 148 \\ + 740 \end{array}$$

Now, we need to add our partial products together.  $148 + 740 = 888$

Yes! We got the same answer!

Tying the learning together:

Let's review! We have multiplied 2-digit numbers by 2-digit numbers using area models, partial products, and the standard algorithm.

Remember when multiplying we work from right to left so that we multiply our smallest numbers first. In our problems that has been what place value? [Pause.] You got it ones! Then we can move to the left to work with 10s, 100s, and even thousands! What did we have to do sometimes as we were multiplying? [Pause.] Yes! We might have to regroup tens, hundreds, or even thousands. Let's continue practicing our multiplication.

Guided Practice (10 min.)

[I do.]

Listen to the problem and follow along.

[Read the problem aloud.]

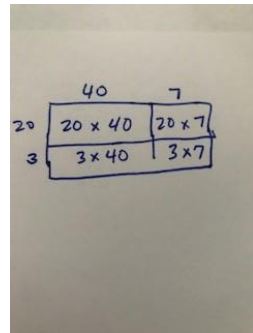
$$\begin{array}{r} 47 \\ \times 23 \\ \hline \end{array}$$

What is 47 times 23? Where do we begin? [Pause.]

That's it! Let's draw an area model. [Draw and explain area model.]

How can we break apart each number? [Pause.]

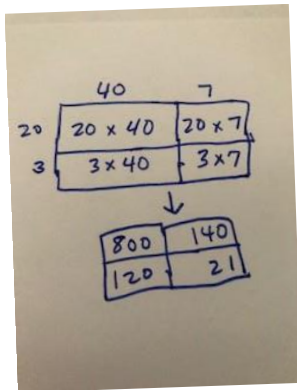
Yes, we could break apart 47 as  $40+7$  and 23 as  $20+3$ . Then, we can write our expressions inside each box.



[I do.]

Students work alongside the teacher as the teacher thinks aloud.

Then, we need to multiply and simplify each expression in the boxes. Why don't you fill in the answers? [Pause] Okay! Check your work with mine. Did you get 800, 140, 120, and 21? Fantastic!



What do the expressions in the smaller rectangles represent?  
[Pause.]

Great job remembering our vocabulary! They represent our partial products. Now, what do we do with these partial products? [Pause.]

Yes, we can add the partial products to get our final answer.  
[Say and write the partial products like the picture.]

$$800 + 140 + 120 + 21 = 1,081$$

[We do.]

Now, can you help me work to find the product by using partial products only? Great! Let's work together!

$$\begin{array}{r} 47 \\ \times 23 \\ \hline \end{array}$$

So, let's begin in the ones place of our second factor. Great question! What is our second factor? That's it! 23. First, we will multiply 3 times the digit in the ones place on our first factor 47. What digit is in the ones place? [Pause.]

Yes, the 7. What is 3 ones times 7 ones? [Pause.]

Yes, 21. [Write and say.]

We will write 21.

[We do.]

Students will respond to teacher questions with less scaffolding than the previous example. Students will have more time to think and respond on their own prior to the teacher providing solutions.



$$\begin{array}{r} 47 \\ \times 23 \\ \hline 21 \end{array}$$

Now we need to multiply the tens.

3 x 4 tens = 12 tens and we know 12 tens = 120

$$\begin{array}{r} 47 \\ \times 23 \\ \hline 21 \\ 120 \end{array}$$

Can you finish from here? I'm going to pause and let you find the other 2 partial products. You can do it! [pause]

Let's check your work!

Did you multiply 2 tens x 7 to get 14 tens or 140?

Did you also multiply 2 tens x 4 tens to get 8 hundreds or 800?

You are amazing! Check your problem with mine.

$$\begin{array}{r} 47 \\ \times 23 \\ \hline 21 \\ 120 \\ 140 \\ + 800 \end{array}$$

Then did you find the sum of the partial products to get 1,081? Excellent work! You are really getting the hang of this!

[You do.]

Can you try the standard algorithm on your own? Same problem!

Find the product of [Write and say.]

$$\begin{array}{r} 47 \\ \times 23 \end{array}$$

I'll give you a minute to work this problem on your own.  
[pause]

[You do.]

Students are working almost exclusively independently with the teacher providing answers at the end.

**Let's see how you did.** [Display the following as you talk through the solution path.]

$$\begin{array}{r}
 1 \\
 2 \\
 47 \\
 \underline{\times 23} \\
 141 \\
 + 940 \\
 \hline
 1,081
 \end{array}$$

You should have begun in the ones place.  
 Multiplied  $3 \times 7 = 21$  Regrouping the 2 tens.  
 Then multiplied  $3 \times 4$  tens = 12 tens  
 Then you should have added the 2 tens that you had regrouped...12 tens + 2 tens equals 14 tens giving 140.  
 $140 + 1 = 141$

Then, you should have multiplied 2 tens  $\times 7 = 14$  tens or 140.  
 Regrouped the 1 hundred.  
 Multiplied 2 tens  $\times 4$  tens = 8 hundreds plus the 1 hundred that was regrouped to be 9 hundreds.  
 $900 + 40 = 940$ .  
 Then add your partial products together.  
 $141 + 940 =$   
 The final answer is 1,081.

It is so exciting to know that you can multiply different ways and get the same answer! If you are having a hard time with 1 method, you can switch and try another. Math is amazing! You have worked really hard today. Give yourself a pat on the back.

Additional Problems (if needed):

$$\begin{array}{lll}
 1. \quad 16 & 2. \quad 15 & 3. \quad 15 \\
 \underline{\times 22} & \underline{\times 16} & \underline{\times 16}
 \end{array}$$

Independent Practice (1 min.)

Today, we reviewed multiplying 2-digit by 2-digit numbers. I hope you're seeing some connections to all of the different ways we can multiply 2-digit by 2-digit numbers! After the video, you will have some problems to practice on your own. Good luck and do your best!

I will show you the independent practice problems now, or you can find them in the student practice for this lesson

## PBS Lesson Series

posted on our website, <a href="http://www.tn.gov/education">www.tn.gov/education</a> . [Teacher shows student practice page under a document camera or camera zooms in on student practice page.]	
<b>Closing</b> (1 min.) <ul style="list-style-type: none"><li>• <b>Students, I enjoyed reviewing using various strategies to multiply with a focus on 2-digit by 2-digit numbers 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!</b></li><li>• <b>Bye!</b></li></ul>	

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