

# Multiply by Two-Digit Numbers



Dear Family,

This week your child is learning to multiply two-digit numbers by two-digit numbers.

Your child is learning to multiply a two-digit number by another two-digit number, such as  $17 \times 38$ .

One way to multiply two-digit numbers is to use an area model. With this strategy, you multiply using the place value of each digit.

The area model below shows the number **17** as **10 + 7** at the left of the rectangle as its width and the number **38** as **30 + 8** along the top of the rectangle as its length. First, find the individual products that represent each individual area. Then add the products together to find the total area. The total area is the product of 17 and 38.

	30	+	8
10	$10 \times 30$ 1 ten $\times$ 3 tens = 3 hundreds <b>300</b>		$10 \times 8$ 1 ten $\times$ 8 = 8 tens <b>80</b>
+			
7	$7 \times 30$ 7 $\times$ 3 tens = 21 tens <b>210</b>		$7 \times 8 =$ <b>56</b>

$$300 + 210 + 80 + 56 = 646$$

$$17 \times 38 = 646$$

Invite your child to share what he or she knows about multiplying by two-digit numbers by doing the following activity together.

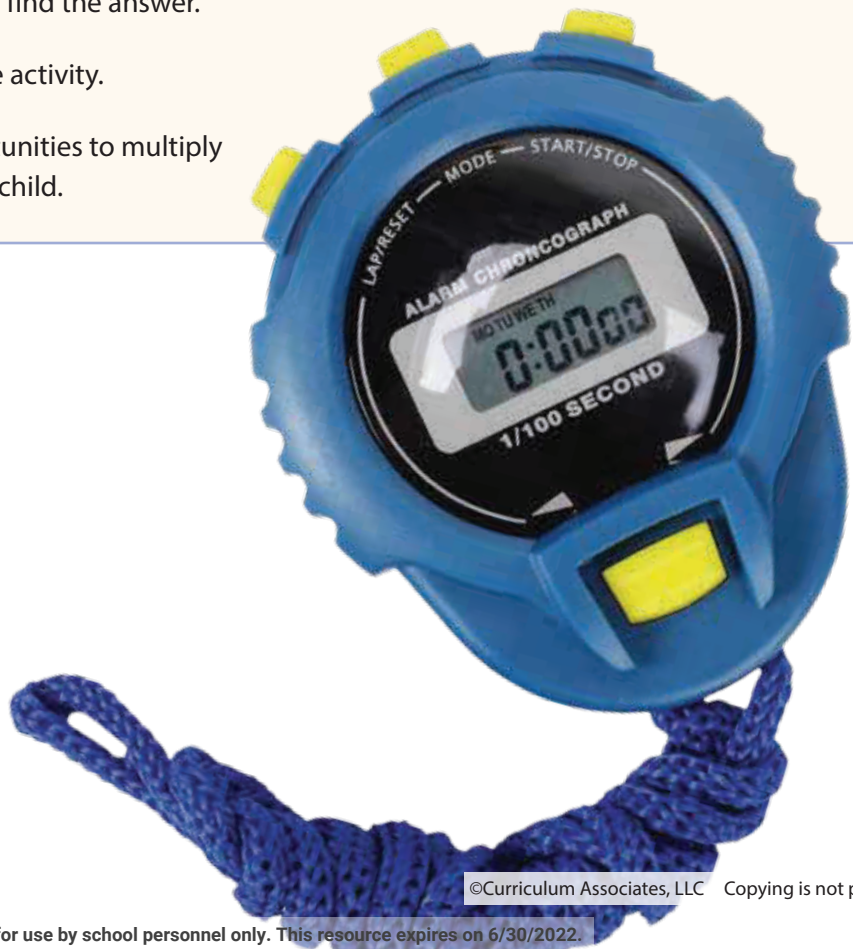
## ACTIVITY MULTIPLYING BY TWO-DIGIT NUMBERS

Do this activity with your child to multiply two-digit numbers.

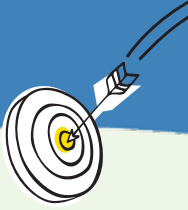
**Materials** timer or watch with a second hand

- Together with your child, think of things that can be counted in one minute, such as the number of times you clap your hands or the number of steps you walk.
- Choose one idea. Have one person do the activity while the other person uses a timer or watch to time the activity for one minute.
- The person doing the activity counts how many. Count carefully. Stop counting when the person with the timer says “Stop!” For example, you might clap your hands for one minute and count 92 claps.
- Have your child use that number to figure out how many could be counted in 15 minutes. For example, to find out the number of times you might clap your hands in 15 minutes, your child would find:  $15 \times 92$ .
- Have your child multiply to find the answer.
- Switch roles and repeat the activity.

Look for other real-life opportunities to multiply two-digit numbers with your child.



# Explore Multiplying by Two-Digit Numbers



## Learning Target

- Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

**SMP** 1, 2, 3, 4, 5, 6, 7


You have learned how to multiply two-digit numbers by one-digit numbers, how to multiply one-digit numbers by multiples of 10, and how to break apart numbers by place value to multiply. Use what you know to try to solve the problem below.

What is the product of 14 and 13?

## TRY IT



## Math Toolkit

- base-ten blocks
- counters
- cups
- paper plates
- grid paper
- multiplication models 



## DISCUSS IT

**Ask your partner:** Can you explain that again?

**Tell your partner:** I am not sure how to find the answer because . . .

# CONNECT IT

## 1 LOOK BACK

Explain how you found the product of 14 and 13.

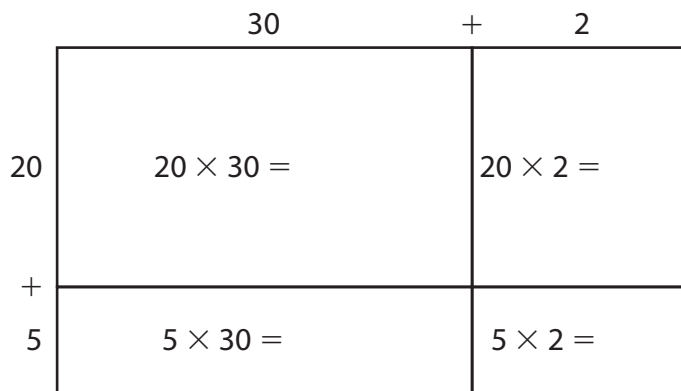
## 2 LOOK AHEAD

To multiply a two-digit number by another two-digit number, you need to understand how to multiply by multiples of 10.

a. Fill in the blanks to show how to multiply by multiples of 10.

Expression	Think of it as ...	Think of it as ...	Product
$3 \times 2$	$3 \times 2$ ones	6 ones	.....
$3 \times 20$	$3 \times 2$ tens	..... tens	60
$30 \times 20$	$3 \text{ tens} \times 2 \text{ tens}$	..... hundreds	600
	$3 \times 10 \times 2 \times 10$		
	$3 \times 2 \times 10 \times 10$		
	$6 \times \dots\dots\dots$		

b. Complete the area model.  
Then add the four partial products to find  $25 \times 32$ .



..... + ..... + ..... + ..... = .....

## 3 REFLECT

Suppose you want to find  $30 \times 30$ . How can you use a basic fact and breaking apart numbers to find the product of these multiples of 10?

.....

.....

# Prepare for Multiplying by Two-Digit Numbers

- 1 Think about what you know about multiplication. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

<p><b>What Is It?</b></p>	<p><b>What I Know About It</b></p>	
<p><b>partial products</b></p>		
<p><b>Examples</b></p>	<p><b>Examples</b></p>	<p><b>Examples</b></p>

- 2 Complete the area model. Then add the four partial products to find  $18 \times 24$ .

	20	+	4
10	$10 \times 20 =$	$10 \times 4 =$	
+			
8	$8 \times 20 =$	$8 \times 4 =$	

..... + ..... + ..... + ..... = .....

- 3 Solve the problem. Show your work.

**What is the product of 16 and 12?**

**Solution** .....

- 4 Check your answer. Show your work.

# Develop Multiplying by Two-Digit Numbers




Read and try to solve the problem below.

**Folding chairs are set up in a school auditorium for a play.  
There are 16 rows of chairs. Each row has 28 chairs.  
How many folding chairs are set up for the play?**

## TRY IT



### Math Toolkit

- base-ten blocks
- grid paper
- multiplication models 



## DISCUSS IT

**Ask your partner:** Why did you choose that strategy?

**Tell your partner:** A model I used was ... It helped me ...

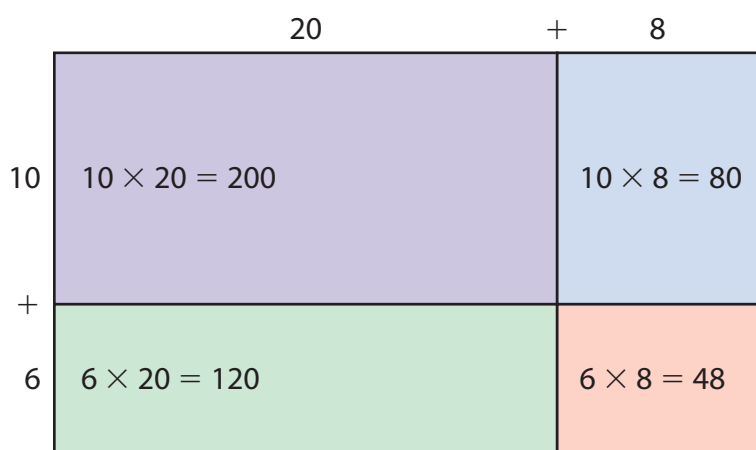
Explore different ways to understand multiplying a two-digit number by a two-digit number.

**Folding chairs are set up in a school auditorium for a play. There are 16 rows of chairs. Each row has 28 chairs. How many folding chairs are set up for the play?**

### PICTURE IT

You can use an area model to multiply two-digit numbers.

To solve this problem, multiply 28 by 16.



$$200 + 80 + 120 + 48 = ?$$

### MODEL IT

You can also multiply two-digit numbers using partial products.

$$\begin{array}{r}
 28 \\
 \times 16 \\
 \hline
 48 \rightarrow 6 \text{ ones} \times 8 \text{ ones} \\
 120 \rightarrow 6 \text{ ones} \times 2 \text{ tens} \\
 80 \rightarrow 1 \text{ ten} \times 8 \text{ ones} \\
 + 200 \rightarrow 1 \text{ ten} \times 2 \text{ tens} \\
 \hline
 ?
 \end{array}$$





## CONNECT IT

Now you will use the problem from the previous page to help you understand how to multiply a two-digit number by a two-digit number.

- 1 Why is the area model divided into four sections?
  
- 2 How do the four steps in the multiplication using partial products in **Model It** relate to the four sections in the area model in **Picture It**?
  
- 3 What is the sum of the partial products and also the product of 28 and 16?  
.....
- 4 Would the product change if 20 + 8 on the top of the area model were changed to 10 + 10 + 8? Explain.
  
- 5 How could you estimate to check the reasonableness of your answer to  $28 \times 16$  by multiplying with easier numbers?
  
- 6 **REFLECT**  
Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for multiplying a two-digit number by a two-digit number? Explain.

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.....

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# Practice Multiplying by Two-Digit Numbers

Study the Example showing how to multiply a two-digit number by a two-digit number to solve a word problem. Then solve problems 1–6.

## EXAMPLE

Aaron spends 35 minutes at each guitar lesson. He has 12 guitar lessons. How many minutes does Aaron spend at his guitar lessons?

Use an area model to multiply 35 by 12.

	30	+	5
10	10 × 30 1 ten × 3 tens = 3 hundreds <b>300</b>		10 × 5 1 ten × 5 = 5 tens <b>50</b>
+			
2	2 × 30 2 × 3 tens = 6 tens <b>60</b>		2 × 5 = <b>10</b>

$$300 + 50 + 60 + 10 = 420$$

Aaron spends 420 minutes at his guitar lessons.

- 1 Look at the Example above. Use partial products to multiply 35 by 12. Fill in the blanks.

$$\begin{array}{r}
 35 \\
 \times 12 \\
 \hline
 10 \rightarrow \dots \text{ones} \times \dots \text{ones} \\
 \square \square \rightarrow 2 \dots \times 3 \dots \\
 50 \rightarrow \dots \text{ten} \times 5 \dots \\
 + \square \square \square \rightarrow \dots \text{ten} \times 3 \dots \\
 \hline
 420
 \end{array}$$

- 2 Show how to use an area model to multiply 71 by 48.

$$71 \times 48 = \dots + \dots + \dots + \dots = \dots$$



3 Show how to use partial products to multiply 48 by 71.

$48 \times 71 = \dots\dots\dots$

4 Tell whether each equation is *True* or *False*.

	True	False
$18 \times 42 = (10 \times 40) + (10 \times 2) + (8 \times 40) + (8 \times 2)$	(A)	(B)
$60 \times 15 = (6 \times 10) + (6 \times 5)$	(C)	(D)
$37 \times 22 = (30 \times 20) + (30 \times 20) + (7 \times 20) + (7 \times 20)$	(E)	(F)
$99 \times 11 = (1 \times 9) + (1 \times 90) + (10 \times 9) + (10 \times 90)$	(G)	(H)

5 Mr. Greene prepares 28 bags of glass tiles for his art class. He puts 40 glass tiles in each bag. How many glass tiles does Mr. Greene use? Estimate to check that your answer is reasonable. Show your work.



**Solution** .....

.....

6 Stephanie has 6 classes a day at school. Each class is 52 minutes long. She goes to school 5 days a week. How much time does she spend in class each week? Show two different ways to solve this problem. Show your work.

**Solution** .....

# Refine Multiplying by Two-Digit Numbers

Complete the Example below. Then solve problems 1–9.

## EXAMPLE

**What is the product of 73 and 58?**

Look at how you could show your work using partial products.

$$\begin{array}{r}
 73 \\
 \times 58 \\
 \hline
 24 \rightarrow 8 \text{ ones} \times 3 \text{ ones} \\
 560 \rightarrow 8 \text{ ones} \times 7 \text{ tens} \\
 150 \rightarrow 5 \text{ tens} \times 3 \text{ ones} \\
 + 3,500 \rightarrow 5 \text{ tens} \times 7 \text{ tens} \\
 \hline
 \end{array}$$

**Solution** .....

The student added the partial products to find  $73 \times 58$ .



## PAIR/SHARE

How else could you solve this problem?

## APPLY IT

**1** Find the product of 15 and 24. Show your work.

Should you multiply  $15 \times 24$  or  $24 \times 15$ ?

**Solution** .....

## PAIR/SHARE

How did you decide which method to use to help you solve the problem?

2 What is the product of 12 and 32? Show your work.

Could you use an area model to help solve the problem?



**Solution** .....

3 A deli is preparing trays of sandwiches. There are 48 trays. Each tray has 23 sandwiches. How many sandwiches are there?

- Ⓐ 240
- Ⓑ 824
- Ⓒ 1,104
- Ⓓ 1,932

Nathan chose Ⓐ as the correct answer. How did he get that answer?

**PAIR/SHARE**

How could you check your answer for reasonableness?

How could partial products help you solve this problem?



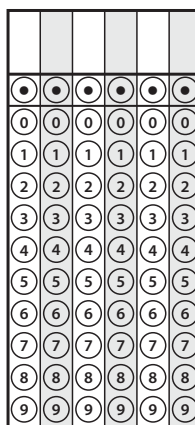
**PAIR/SHARE**

Does Nathan's answer make sense?

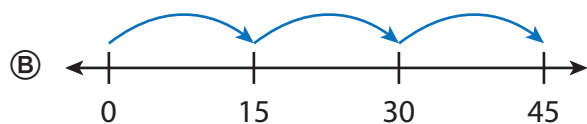
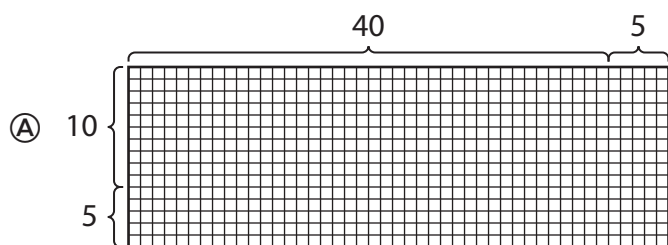
4 A person blinks about 16 times per minute. About how many times does a person blink in 3 hours? [Hint: 1 hour = 60 minutes]

- (A) 48
- (B) 96
- (C) 960
- (D) 2,880

5 What is the product of 47 and 91?

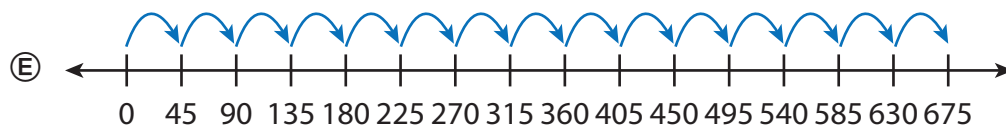


6 Which models below could represent the solution to the problem  $45 \times 15$ ?



(C)  $(4 \times 1) + (4 \times 5) + (5 \times 1) + (5 \times 5)$

(D)  $(10 \times 40) + (10 \times 5) + (5 \times 40) + (5 \times 5)$



7 Complete each equation below using a factor between 20 and 30 so that:

- The missing factor in Ian's equation will give the greatest possible three-digit product.
- The missing factor in Tia's equation will give the least possible four-digit product.

Ian's equation:  $43 \times \dots = \dots$

Tia's equation:  $43 \times \dots = \dots$

8 Mo has 14 tutoring sessions. Each session is 35 minutes long. How many minutes does Mo spend in the 14 sessions? Show your work.

**Solution** .....

## 9 MATH JOURNAL

Write a word problem you can solve by multiplying 2 two-digit numbers. Solve the problem and show how to find the answer.



**SELF CHECK** Go back to the Unit 3 Opener and see what you can check off.