

1-DIGIT BY 2-DIGITS • 1-DIGIT BY 3-DIGITS
2-DIGITS BY 2-DIGITS • EXTENDING PAST 2-BY-2

THE AREA MODEL

for multi-digit multiplication



Name: _____

MULTIPLYING 2-DIGIT NUMBERS BY 2-DIGIT NUMBERS

Now that we know how to multiply a 1-digit number by a 2 and 3-digit number, we can use the exact same process to multiply a 2-digit number by a 2-digit number.

To multiply 12×13 :

Step 1: Decompose 12 and 13 into their expanded forms $12=10+2$ and $13=10+3$.

Step 2: Use the expanded forms to label the left side and top of the rectangle.

Step 4: Multiply each part (this time there are 4 parts).

Step 5: Add the parts.

	10	+	3	
10	$10 \times 10 = 100$		$10 \times 3 = 30$	
+				
2	$2 \times 10 = 20$		$2 \times 3 = 6$	
	$100 + 30 + 20 + 6 = 156$			
	So, $12 \times 13 = 156$			

Name: _____

BREAKING UP A RECTANGLE

We can break a rectangle into smaller parts to make it easier to find the area.

Let's find the area of this rectangle by breaking it into two smaller parts.

$3 \times 10 = 30$ $3 \times 2 = 6$

The area of the grey part is 30 square units. The area of the white part is 6 square units. $30 + 6 = 36$ so the area of the entire rectangle is 36 square units.

Now it's your turn! Find the area of each rectangle by first finding the area of the two smaller parts. Then add them together to find the total area.

The area of the entire rectangle is _____

_____ x _____ = _____ _____ x _____ = _____

The area of the entire rectangle is _____

_____ x _____ = _____ _____ x _____ = _____

About This Resource

The area model for multiplication is a model where the factors are the side lengths of the rectangle, and the product is the area.

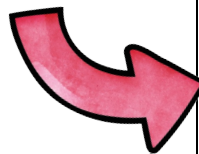
This model helps students **build their understanding** of multiplication and is an effective way to transition to multi-digit multiplication. If you plan to teach the traditional algorithm, the area model can be an excellent way to begin, ensuring that understanding is built along the way.

This **extensive resource** helps students progress from **beginning** to **advanced understanding** of the area model.

Here's what's included:

Introductory Activities

Activities to activate prior knowledge of area and decomposing a rectangle into smaller parts.
(2 pages)



Name: _____

REFLECTING ON AREA

Let's reflect on what we know about area.

When you first learned about area, you probably learned to count the units inside a rectangle. For example, the area of a rectangle is 12 square units.

Next, you learned that you can multiply the side lengths. For example, we can multiply 3×4 to find the area of 12 square units.

Then, you learned that even without the unit squares drawn, we can still multiply the side lengths to find the total area.

There is a connection between **area** and **multiplication**.

When we multiply two numbers, we can imagine that we are drawing a rectangle with those side lengths.

Find the area of each rectangle and write an equation to show your work.

9 units 5 units		11 units 8 units	
12 units 7 units		10 units 3 units	

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Name: _____

BREAKING UP A RECTANGLE

We can break a rectangle into smaller parts to make it easier to find the area.

Let's find the area of this rectangle by breaking it into two smaller parts.

The area of the grey part is 30 square units. The area of the white part is 6 square units. $30 + 6 = 36$ so the area of the entire rectangle is 36 square units.

Now it's your turn! Find the area of each rectangle by first finding the area of the two smaller parts. Then add them together to find the total area.

The area of the entire rectangle is _____

The area of the entire rectangle is _____

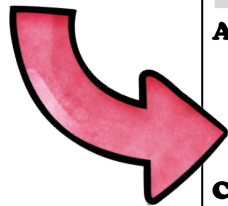
The area of the entire rectangle is _____

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1-DIGIT BY 2-DIGIT MULTIPLICATION

Activities to transition students from an area model with gridlines to a rectangle with side lengths labelled. Students will practice using the expanded form to label the sides. They will also work on using estimation strategies to estimate the product. (8 pages)



Name: _____

ORDER THE AREAS

Solve each problem using the area model.

A $2 \times 48 = \underline{\quad}$

B $6 \times 23 = \underline{\quad}$

C $4 \times 42 = \underline{\quad}$

D $3 \times 18 = \underline{\quad}$

E $5 \times 65 = \underline{\quad}$

F $4 \times 44 = \underline{\quad}$

Name: _____

FIND THE MISSING SIDE LENGTHS

Let's try something different. For each rectangle, one or more of the side lengths are missing. Fill in the missing side lengths and the multiplication equation.

$30 \times \underline{\quad} = \underline{\quad}$

$5 \times \underline{\quad} = \underline{\quad}$

$80 \times \underline{\quad} = \underline{\quad}$

$140 \times \underline{\quad} = \underline{\quad}$

$100 \times \underline{\quad} = \underline{\quad}$

$5 \times \underline{\quad} = \underline{\quad}$

Name: _____

ESTIMATING THE PRODUCT

Estimation can help us find an answer that is **close** to the actual answer.

Example: Without solving this problem, we know that the product is more than 200 (because $4 \times 50 = 200$) but less than 240 (because $4 \times 60 = 240$). $4 \times 52 = \underline{\quad} ?$

For each problem below, estimate the product. Then use the area model to figure out the actual product.

6 x 18	5 x 32
Estimate: I know that the product is more than _____ because $\underline{\quad} \times \underline{\quad} = \underline{\quad}$. I know the product is less than _____ because $\underline{\quad} \times \underline{\quad} = \underline{\quad}$. I estimate that the product is about _____.	Estimate: I know that the product is more than _____ because $\underline{\quad} \times \underline{\quad} = \underline{\quad}$. I know the product is less than _____ because $\underline{\quad} \times \underline{\quad} = \underline{\quad}$. I estimate that the product is about _____.
Now use the area model to solve:	Now use the area model to solve:

Name: _____

THE AREA MODEL

Now that you know how to break up a rectangle into parts, we can do it without drawing the gridlines.

These two models represent the same multiplication equation: $3 \times 12 = 36$.

$3 \times 10 = 30$ and $3 \times 2 = 6$

What is the total area of these rectangles? _____

Guess what? You just used the **area model!** We can use the area model as a visual model to help us multiply big numbers.

Use the area model to find each product.

Solve 5x15 Step 1: Multiply each part. Step 2: Add the parts. $5 \times 15 = \underline{\quad}$	Solve 4x17 Step 1: Multiply each part. Step 2: Add the parts. $4 \times 17 = \underline{\quad}$
Solve 9x23 Step 1: Multiply each part. Step 2: Add the parts. $9 \times 23 = \underline{\quad}$	Solve 6x14 Step 1: Multiply each part. Step 2: Add the parts. $6 \times 14 = \underline{\quad}$

Name: _____

EXPANDED FORM

By now you have probably noticed that when we decompose the side length into two parts, we are breaking it up by place value. For example, a side length of 12 can be decomposed into 10 and 2 or a side length of 17 can be decomposed into 10 and 7.

Let's practice decomposing by place value. Write the expanded form of each number.

86 _____ 136 _____ 5,472 _____
95 _____ 981 _____ 1,039 _____
17 _____ 445 _____ 12,673 _____

Use what you know about expanded form to label the sides of each rectangle and solve.

Solve 3x13

- Write "3" on the left side of the rectangle.
- The expanded form of 13 is $\underline{\quad} + \underline{\quad}$. Write those numbers on the top of the rectangle.
- Multiply each part.
- Add the two parts together: $\underline{\quad} + \underline{\quad} = \underline{\quad}$
- $3 \times 13 = \underline{\quad}$

Solve 8x24

- Write "8" on the left side of the rectangle.
- The expanded form of 24 is $\underline{\quad} + \underline{\quad}$. Write those numbers on the top of the rectangle.
- Multiply each part.
- Add the two parts together: $\underline{\quad} + \underline{\quad} = \underline{\quad}$
- $8 \times 24 = \underline{\quad}$

Name: _____

1-DIGIT BY 2-DIGIT MULTIPLICATION

Use the area model to multiply.

$8 \times 21 = \underline{\quad}$	$5 \times 12 = \underline{\quad}$
$3 \times 34 = \underline{\quad}$	$7 \times 26 = \underline{\quad}$
$4 \times 32 = \underline{\quad}$	$9 \times 19 = \underline{\quad}$
$6 \times 51 = \underline{\quad}$	$2 \times 87 = \underline{\quad}$

2-DIGIT BY 2-DIGIT MULTIPLICATION

Now students will transition to 2-digit by 2-digit multiplication by expanding both factors. Students are scaffolded through this process.

(7 pages)

Name: _____

SOLVE THE PROBLEMS

Use the area model to solve the problems.

The cost to enter the circus is \$14 for adults and \$8 for kids. There are 54 adults and 85 kids at the first show. At the second show, there are 46 adults and 67 kids.

How much money was made at the first show?

How much money was made at the second show?

How much money was made in all throughout the day?

Name: _____

2-DIGIT BY 2-DIGIT MULTIPLICATION

Use the area model to multiply.

36 x 19 = _____

70 x 80 = _____

Name: _____

36 x 11

Estimate:

I know that the product is more than _____ because _____ x _____ = _____.

I know the product is less than _____ because _____ x _____ = _____.

I estimate that the product is about _____.

Now use the area model to solve:

Was your estimate close? How close?

Name: _____

MULTIPLYING 2-DIGIT NUMBERS BY 2-DIGIT NUMBERS

Now that we know how to multiply a 1-digit number by a 2 and 3-digit number, we can use the exact same process to multiply a 2-digit number by a 2-digit number.

To multiply 12 x 13:

	10	+	3
10	10x10=100		10x3=30
+			
2	2x10=20		2x3=6

100+30+20+6=156

So, 12x13=156

Use the area model to solve.

Solve 15x16

	10	+	6
10	10x10=_____		10x6=_____
+			
5	5x10=_____		5x6=_____

Step 1: Multiply each part.
Step 2: Add the parts.

_____ + _____ + _____ + _____ = _____

15x16=_____

Solve 21x18

	10	+	8
20	20x10=_____		20x8=_____
+			
1	1x10=_____		1x8=_____

Step 1: Multiply each part.
Step 2: Add the parts.

_____ + _____ + _____ + _____ = _____

21x18=_____

Name: _____

FIND THE MISSING SIDE LENGTHS

Let's try something different. For each rectangle, one or more of the side lengths are missing. Fill in the missing side lengths and the multiplication equation that is represented.

		+	
100			90
+			
30			27

_____ x _____ = _____

		+	
400			20
+			
40			2

_____ x _____ = _____

		+	
200			20
+			
180			18

_____ x _____ = _____

		+	
800			10
+			
0			0

_____ x _____ = _____

		+	
300			50
+			
150			25

_____ x _____ = _____

		+	
100			40
+			
30			12

_____ x _____ = _____

Name: _____

ESTIMATING THE PRODUCT

Estimation can help us find an answer that is **close** to the actual answer.

Example:

Without solving this problem, we know that the product is more than 200 (because 10x20=200) but less than 300 (because 15x20=300).

13 x 21 = ?

For each problem below, estimate the product. Then use the area model to figure out the actual product.

19 x 12

Estimate:

I know that the product is more than _____ because _____ x _____ = _____.

I know the product is less than _____ because _____ x _____ = _____.

I estimate that the product is about _____.

Now use the area model to solve:

Was your estimate close? How close?

22 x 16

Estimate:

I know that the product is more than _____ because _____ x _____ = _____.

I know the product is less than _____ because _____ x _____ = _____.

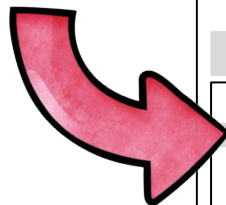
I estimate that the product is about _____.

Now use the area model to solve:

Was your estimate close? How close?

EXTENDING PAST 2-DIGIT BY 2-DIGIT

In this wind-up section, students will understand that this process can be used to multiply factors with any number of digits. They will also compare the area model to other strategies, allowing them to form new connections.
(2 pages)



Name: _____

COMPARING THE AREA MODEL TO OTHER STRATEGIES

Solve each problem using the area model and then one other strategy. Circle the one you like better.

$18 \times 35 = \underline{\hspace{2cm}}$

Area Model: A Different Strategy:

$125 \times 13 = \underline{\hspace{2cm}}$

Area Model: A Different Strategy:

$35 \times 211 = \underline{\hspace{2cm}}$

Area Model: A Different Strategy:

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Name: _____

EXTENDING WHAT WE KNOW

Now that we know how to use the area model, we can use it to solve problems with any number of digits! Use the area model to solve each multiplication problem below.

Solve 54×125

Step 1: Multiply each part.
Step 2: Add the parts.

	100	20	5
50	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$
+	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$
4	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

$54 \times 125 = \underline{\hspace{2cm}}$

Solve 112×121

Step 1: Multiply each part.
Step 2: Add the parts.

	100	20	1
100	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$
+	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$
10	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$
+	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$
2	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

$112 \times 121 = \underline{\hspace{2cm}}$

Solve 135×26

Step 1: Multiply each part.
Step 2: Add the parts.

	20	6
100	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$
+	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$
30	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$
+	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$
5	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$	$\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

$135 \times 26 = \underline{\hspace{2cm}}$

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MORE SUPPORT WITH THE AREA MODEL

Base ten blocks are a fun, conceptual way to introduce your students to the area model before transitioning to a more abstract format.

See more about the entire area model progression here.

<https://shelleygrayteaching.com/multiplication-area-model/>

