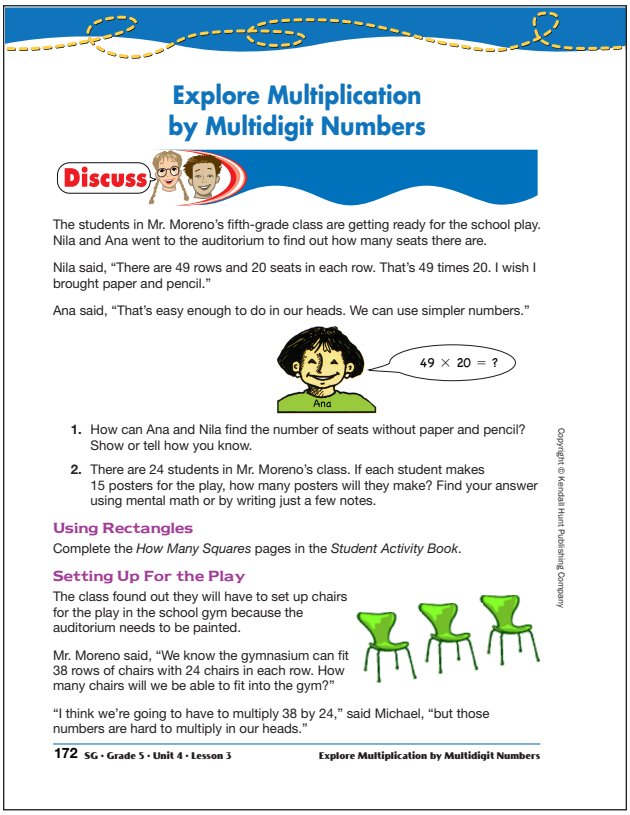

Explore Multiplication by Multidigit Numbers

Discuss

The students in Mr. Moreno's fifth-grade class are getting ready for the school play. Nila and Ana went to the auditorium to find out how many seats there are.

Nila said, "There are 49 rows and 20 seats in each row. That's 49 times 20. I wish I brought paper and pencil."

Ana said, "That's easy enough to do in our heads. We can use simpler numbers."

1. How can Ana and Nila find the number of seats without paper and pencil? Show or tell how you know.
2. There are 24 students in Mr. Moreno's class. If each student makes 15 posters for the play, how many posters will they make? Find your answer using mental math or by writing just a few notes.

Using Rectangles

Complete the *How Many Squares* pages in the *Student Activity Book*.

Setting Up For the Play

The class found out they will have to set up chairs for the play in the school gym because the auditorium needs to be painted.

Mr. Moreno said, "We know the gymnasium can fit 38 rows of chairs with 24 chairs in each row. How many chairs will we be able to fit into the gym?"

"I think we're going to have to multiply 38 by 24," said Michael, "but those numbers are hard to multiply in our heads."

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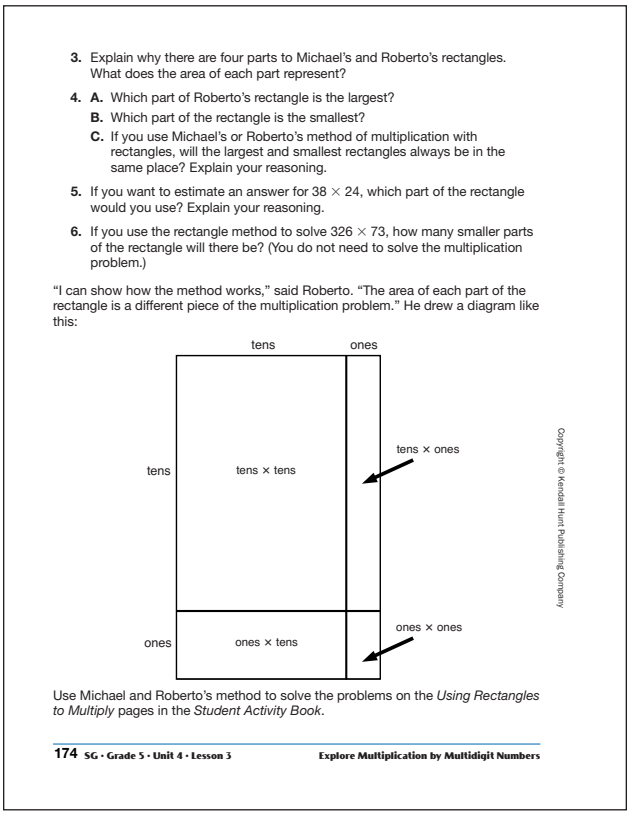

3. Explain why there are four parts to Michael's and Roberto's rectangles. What does the area of each part represent?
4. **A.** Which part of Roberto's rectangle is the largest?
   B. Which part of the rectangle is the smallest?
   C. If you use Michael's or Roberto's method of multiplication with rectangles, will the largest and smallest rectangles always be in the same place? Explain your reasoning.
5. If you want to estimate an answer for 38 × 24, which part of the rectangle would you use? Explain your reasoning.
6. If you use the rectangle method to solve 326 × 73, how many smaller parts of the rectangle will there be? (You do not need to solve the multiplication problem.)

"I can show how the method works," said Roberto. "The area of each part of the rectangle is a different piece of the multiplication problem." He drew a diagram like this:

Use Michael and Roberto's method to solve the problems on the *Using Rectangles to Multiply* pages in the *Student Activity Book*.

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Student Guide

Explore Multiplication by Multidigit Numbers (SG pp. 172–176)
Questions 1–11

1.* 980 seats
Answers may vary. Using mental math, multiply 50 × 20, then subtract 20.
50 × 20 − 20 = 1000 − 20 = 980

2.* 360 posters
10 × 24 = 240; 5 × 24 is half of 10 × 24 or 120; 240 + 120 = 360.

3. Answers may vary. There are four parts to Michael's amd Roberto's rectangles because each of the two 2-digit numbers is written in expanded form.
600 = 30 × 20
120 = 30 × 4
160 = 8 × 20
32 = 8 × 4

4. A. 30 × 20

B. 8 × 4

C.* Answers will vary. Yes, when we place the numbers on the rectangle in expanded form, going across we put the tens first and then the ones. When we place the numbers in expanded form on the left side, we move from top to bottom.

5.* The top left rectangle. It takes into account the largest part of the product.

6. 6 parts

***Answers and/or discussion are included in the lesson.**

7. Answers may vary. Each set of numbers multiplied together in Shannon's expanded form is the same as what was multiplied together for each of the smaller rectangles in Roberto's model.

8. A. Irma's answer is not reasonable. Her method does not work because she did not multiply every part she needed to.

B. 20 × 2 and 3 × 50

C. 1196

9. A.

70 + 0
×
90 + 2
6300
0
140
0
6440

B.

20 + 7
×
80 + 6
1600
560
120
42
2322

C.

50 + 5
×
90 + 9
4500
450
450
45
5445

10. Answers will vary.

A. Possible response:

	80	6
20	1600	120
7	560	42

1600 + 560 + 120 + 42 = 2322

B. Possible Response:

55 × 99 → 55 × 100 = 5500

5500 − 55 = 5445

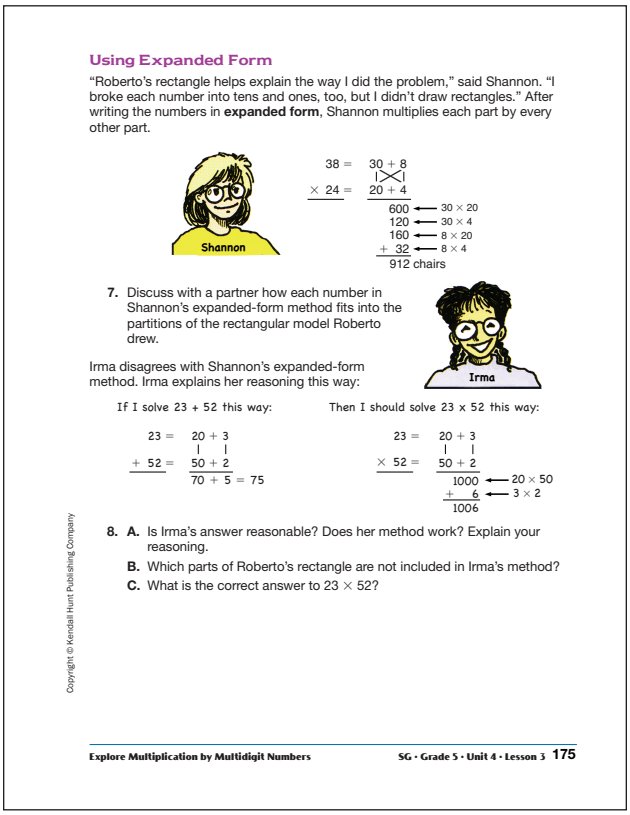
11. Answers may vary.

A.

	60	8
50	50 × 60 = 3000	50 × 8 = 400
3	6 × 30 = 180	3 × 8 = 24

68 × 53 = 3000 + 400 + 180 + 24 = 3604

B. Michael made a place-value error when he multiplied 60 × 50. He said it equals 300, but 60 × 50 = 3000.



Using Expanded Form

"Roberto's rectangle helps explain the way I did the problem," said Shannon. "I broke each number into tens and ones, too, but I didn't draw rectangles." After writing the numbers in **expanded form**, Shannon multiplies each part by every other part.

Shannon

38 = 30 + 8
× 24 = 20 + 4
600 ← 30 × 20
120 ← 30 × 4
160 ← 8 × 20
+ 32 ← 8 × 4
912 chairs

7. Discuss with a partner how each number in Shannon's expanded-form method fits into the partitions of the rectangular model Roberto drew.

Irma disagrees with Shannon's expanded-form method. Irma explains her reasoning this way:

Irma

If I solve 23 + 52 this way:

23 = 20 + 3
+ 52 = 50 + 2
70 + 5 = 75

Then I should solve 23 x 52 this way:

23 = 20 + 3
× 52 = 50 + 2
1000 ← 20 × 50
+ 6 ← 3 × 2
1006

8. **A.** Is Irma's answer reasonable? Does her method work? Explain your reasoning.
B. Which parts of Roberto's rectangle are not included in Irma's method?
C. What is the correct answer to 23 × 52?

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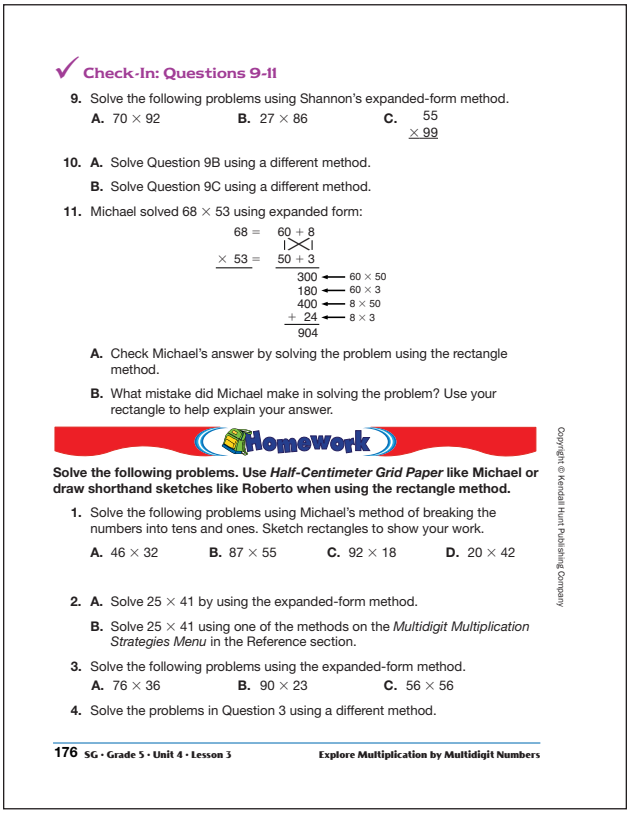

✓ Check-In: Questions 9–11

9. Solve the following problems using Shannon's expanded-form method.
A. 70 × 92 **B.** 27 × 86 **C.** 55 × 99

10. **A.** Solve Question 9B using a different method.
B. Solve Question 9C using a different method.

11. Michael solved 68 × 53 using expanded form:

68 = 60 + 8
× 53 = 50 + 3
300 ← 60 × 50
180 ← 60 × 3
400 ← 8 × 50
+ 24 ← 8 × 3
904

A. Check Michael's answer by solving the problem using the rectangle method.
B. What mistake did Michael make in solving the problem? Use your rectangle to help explain your answer.

Homework

Solve the following problems. Use *Half-Centimeter Grid Paper* like Michael or draw shorthand sketches like Roberto when using the rectangle method.

1. Solve the following problems using Michael's method of breaking the numbers into tens and ones. Sketch rectangles to show your work.
A. 46 × 32 **B.** 87 × 55 **C.** 92 × 18 **D.** 20 × 42

2. **A.** Solve 25 × 41 by using the expanded-form method.
B. Solve 25 × 41 using one of the methods on the *Multidigit Multiplication Strategies Menu* in the Reference section.

3. Solve the following problems using the expanded-form method.
A. 76 × 36 **B.** 90 × 23 **C.** 56 × 56

4. Solve the problems in Question 3 using a different method.

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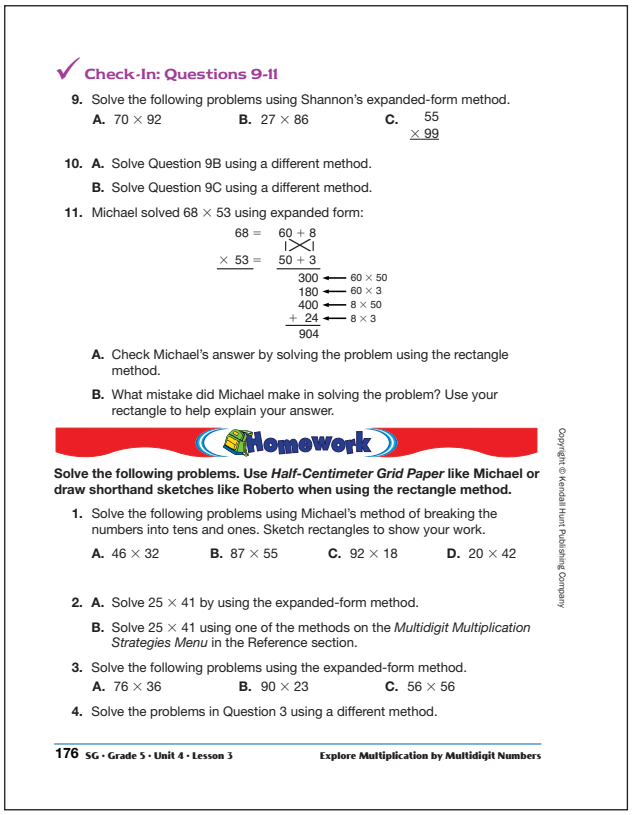

✓ Check-In: Questions 9-11

9. Solve the following problems using Shannon's expanded-form method.

A. 70×92 **B.** 27×86 **C.** 55×99

10. A. Solve Question 9B using a different method.

B. Solve Question 9C using a different method.

11. Michael solved 68×53 using expanded form:

$68 = 60 + 8$

$\times 53 = 50 + 3$

$300 \leftarrow 60 \times 50$

$180 \leftarrow 60 \times 3$

$400 \leftarrow 8 \times 50$

$+ 24 \leftarrow 8 \times 3$

904

A. Check Michael's answer by solving the problem using the rectangle method.

B. What mistake did Michael make in solving the problem? Use your rectangle to help explain your answer.

Homework

Solve the following problems. Use *Half-Centimeter Grid Paper* like Michael or draw shorthand sketches like Roberto when using the rectangle method.

1. Solve the following problems using Michael's method of breaking the numbers into tens and ones. Sketch rectangles to show your work.

A. 46×32 **B.** 87×55 **C.** 92×18 **D.** 20×42

2. A. Solve 25×41 by using the expanded-form method.

B. Solve 25×41 using one of the methods on the *Multidigit Multiplication Strategies Menu* in the Reference section.

3. Solve the following problems using the expanded-form method.

A. 76×36 **B.** 90×23 **C.** 56×56

4. Solve the problems in Question 3 using a different method.

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Homework (SG p. 176)

Questions 1–4

1. A.

	40	6
30	$30 \times 40 = 1200$	$30 \times 6 = 180$
2	$2 \times 40 = 80$	$2 \times 6 = 12$

$46 \times 32 = 1200 + 180 + 80 + 12 = 1472$

B.

	80	7
50	$50 \times 80 = 4000$	$50 \times 7 = 350$
5	$5 \times 80 = 400$	$5 \times 7 = 35$

$87 \times 55 = 4000 + 350 + 400 + 35 = 4785$

C.

	90	2
10	$10 \times 90 = 900$	$10 \times 2 = 20$
8	$8 \times 90 = 720$	$8 \times 2 = 16$

$92 \times 18 = 900 + 720 + 20 + 16 = 1656$

D.

	20
40	$40 \times 20 = 800$
2	$2 \times 20 = 40$

$20 \times 42 = 800 + 40 = 840$

2. A.

$25 = 20 + 5$

$\times 41 = 40 + 1$

5

20

200

800

1025

B. Strategies will vary.

$25 \times 41 = 25 \times 40 + 25 =$

$1000 + 25 = 1025$

3. A.

$76 = 70 + 6$

$\times 36 = 30 + 6$

2100

180

420

36

2736

B.

$90 = 90 + 0$

$\times 23 = 20 + 3$

1800

270

2070

C.

$56 = 50 + 6$

$\times 56 = 50 + 6$

36

300

300

2500

3136

4. Strategies will vary. Possible solutions:

A.

	30	6
70	$70 \times 30 = 2100$	$70 \times 6 = 420$
6	$6 \times 30 = 180$	$6 \times 6 = 36$

$76 \times 36 = 2100 + 420 + 180 + 36 = 2736$

B. $90 \times 23 = (100 \times 23) - 10\,(23) = 2300 - 230 = 2070$

C.

56

$\times \ 56$

36

300

300

2500

3136