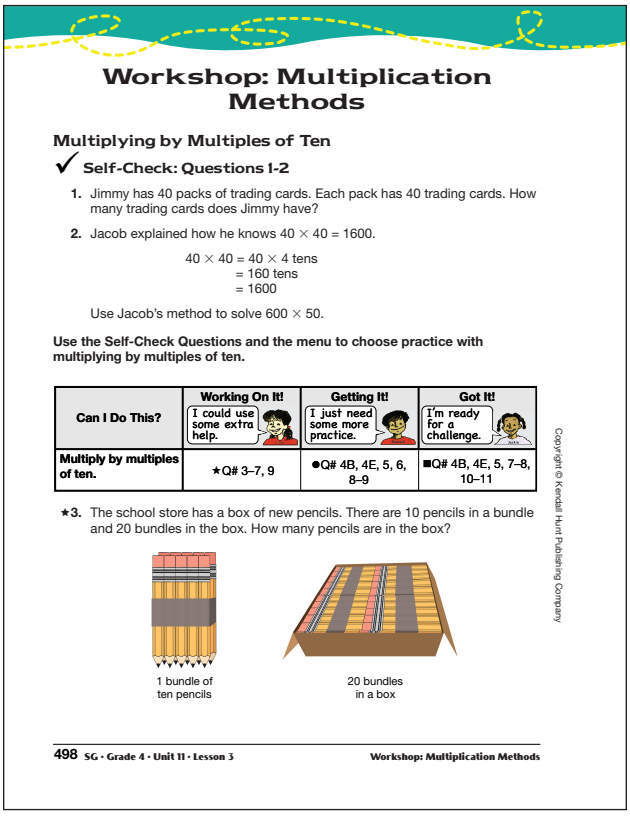
Student Guide

Workshop: Multiplication Methods

Questions 1–11 (SG pp. 498–500)

1. 1600 trading cards
2. $600 \times 50 = 600 \times 5$ tens
   $= 3000$ tens
   $= 30{,}000$
3. 200 pencils; 20 bundles $\times$ 10 pencils per bundle = 200 pencils
4. Responses may vary. Possible reponse:
   - **A.** I understand Lee Yah's strategy best.
   - **B.** Nicholas's is most efficient. It's very quick.
   - **C.** 1200; I used Jacob's strategy.
     $30 \times 40 = 30 \times 4$ tens
     $= 120$ tens
     $= 1200$
   - **D.** 4000; I used Lee Yah's strategy, skip counting. I counted 200 twenty times, 200, 400, 600, 800, 1000, 1200, 1400, 1600, 1800, 2000, 2200, 2400, 2600, 2800, 3000, 3200, 3400, 3600, 3800, 4000.
   - **E.** 16,000; $8 \times 2 = 16$. 16,000 because there are three zeros in the problem.
5. Responses may vary.



Workshop: Multiplication Methods

Multiplying by Multiples of Ten

✓ Self-Check: Questions 1-2

1. Jimmy has 40 packs of trading cards. Each pack has 40 trading cards. How many trading cards does Jimmy have?
2. Jacob explained how he knows $40 \times 40 = 1600$.

$40 \times 40 = 40 \times 4$ tens
$= 160$ tens
$= 1600$

Use Jacob's method to solve 600×50.

Use the Self-Check Questions and the menu to choose practice with multiplying by multiples of ten.

Can I Do This?	Working On It! I could use some extra help.	Getting It! I just need some more practice.	Got It! I'm ready for a challenge.
Multiply by multiples of ten.	★Q# 3–7, 9	●Q# 4B, 4E, 5, 6, 8–9	■Q# 4B, 4E, 5, 7–8, 10–11

★3. The school store has a box of new pencils. There are 10 pencils in a bundle and 20 bundles in the box. How many pencils are in the box?

1 bundle of ten pencils

20 bundles in a box

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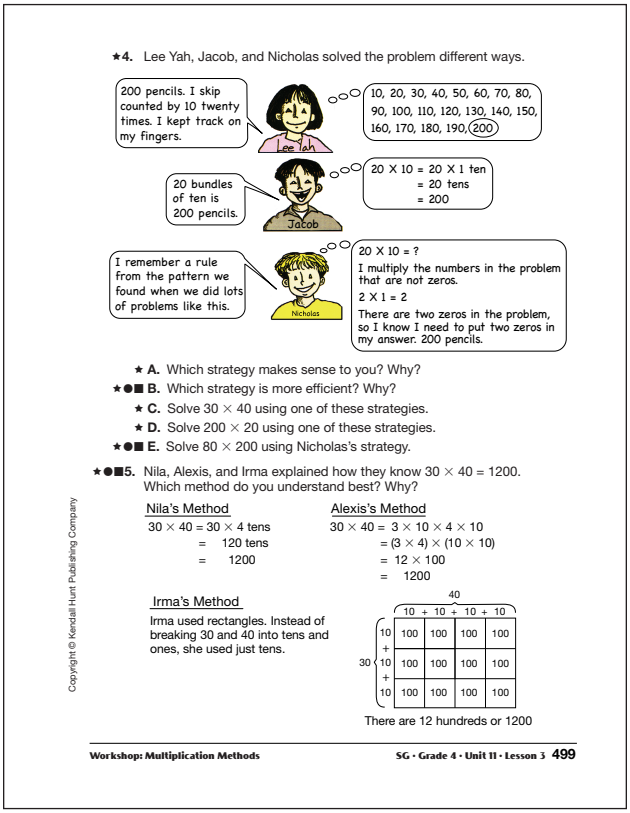

★4. Lee Yah, Jacob, and Nicholas solved the problem different ways.

Lee Yah: 200 pencils. I skip counted by 10 twenty times. I kept track on my fingers.
10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200

Jacob: 20 bundles of ten is 200 pencils.
$20 \times 10 = 20 \times 1$ ten
$= 20$ tens
$= 200$

Nicholas: I remember a rule from the pattern we found when we did lots of problems like this.
$20 \times 10 = ?$
I multiply the numbers in the problem that are not zeros.
$2 \times 1 = 2$
There are two zeros in the problem, so I know I need to put two zeros in my answer. 200 pencils.

★ A. Which strategy makes sense to you? Why?
★●■ B. Which strategy is more efficient? Why?
★ C. Solve 30×40 using one of these strategies.
★ D. Solve 200×20 using one of these strategies.
★●■ E. Solve 80×200 using Nicholas's strategy.

★●■5. Nila, Alexis, and Irma explained how they know $30 \times 40 = 1200$. Which method do you understand best? Why?

Nila's Method
$30 \times 40 = 30 \times 4$ tens
$= 120$ tens
$= 1200$

Alexis's Method
$30 \times 40 = 3 \times 10 \times 4 \times 10$
$= (3 \times 4) \times (10 \times 10)$
$= 12 \times 100$
$= 1200$

Irma's Method
Irma used rectangles. Instead of breaking 30 and 40 into tens and ones, she used just tens.

30 \ 40	10 + 10 + 10 + 10
10 + 10 + 10	100 100 100 100
	100 100 100 100
	100 100 100 100

There are 12 hundreds or 1200

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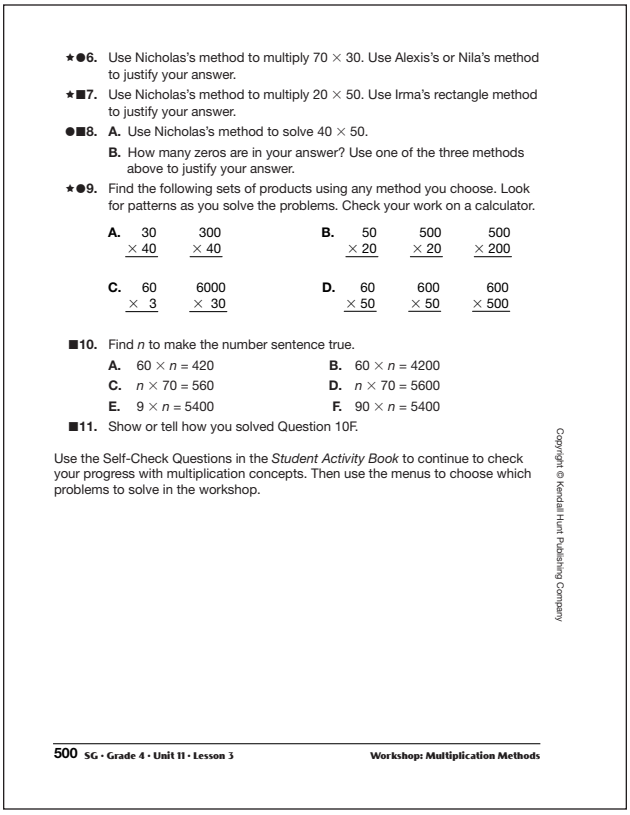

★●6. Use Nicholas's method to multiply 70 × 30. Use Alexis's or Nila's method to justify your answer.

★■7. Use Nicholas's method to multiply 20 × 50. Use Irma's rectangle method to justify your answer.

●■8. **A.** Use Nicholas's method to solve 40 × 50.

B. How many zeros are in your answer? Use one of the three methods above to justify your answer.

★●9. Find the following sets of products using any method you choose. Look for patterns as you solve the problems. Check your work on a calculator.

A. 30 × 40 = 300 × 40 =

B. 50 × 20 = 500 × 20 = 500 × 200 =

C. 60 × 3 = 6000 × 30 =

D. 60 × 50 = 600 × 50 = 600 × 500 =

■10. Find *n* to make the number sentence true.

A. 60 × *n* = 420 **B.** 60 × *n* = 4200

C. *n* × 70 = 560 **D.** *n* × 70 = 5600

E. 9 × *n* = 5400 **F.** 90 × *n* = 5400

■11. Show or tell how you solved Question 10F.

Use the Self-Check Questions in the *Student Activity Book* to continue to check your progress with multiplication concepts. Then use the menus to choose which problems to solve in the workshop.

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6. $7 \times 3 = 21$. 2100 because there are 2 zeros in the problem.

Using Alexis's method:

$70 \times 30 = 7 \times 10 \times 3 \times 10$
$= (7 \times 3) \times (10 \times 10)$
$= 21 \times 100$
$= 2100$

Using Nila's method:

$70 \times 30 = 70 \times 3$ tens
$= 210$ tens
$= 2100$

7. $2 \times 5 = 10$. 1000 because I add the 2 zeros in the problem to the answer.

	10	+10	+10	+10	+10
10	100	100	100	100	100
+ 10	100	100	100	100	100

$20 \times 50 =$ 2 rows of 500
$=$ 2 500 ×
$=$ 1000

8. A. $4 \times 5 = 20$, and I add the 2 zeros in the problem to the answer to get 2000.

B. 3 zeros. Possible response:

$40 \times 50 = 4 \times 10 \times 5 \times 10$
$= (4 \times 5) \times (10 \times 10)$
$= 20 \times 100$
$= 2000$

9. A. 1200; 12,000

B. 1000; 10,000; 100,000

C. 180; 180,000

D. 3000; 30,000; 300,000

10. A. $n = 7$ **B.** $n = 70$

C. $n = 8$ **D.** $n = 80$

E. $n = 600$ **F.** $n = 60$

11. Possible response: First I thought $9 \times 6 = 54$. Then I thought about zeros. There are 2 zeros in 5400 and one in 90. $90 \times ? = 5400$
$90 \times 60 = 5400$

Student Activity Book

Moving Ahead with Multiplication

Questions 1–29 (SAB pp. 481–495)

1.

	60	4
30	$30 \times 60 = 1800$	$30 \times 4 = 120$
2	$2 \times 60 = 120$	8

1800
120
120
+ 8
2048

2. A.

$$\begin{array}{r} 12 \\ \times\ 52 \\ \hline 500 \\ 100 \\ 20 \\ +\ \ 4 \\ \hline 624 \end{array}$$

B. $50 \times 10 = 500$

C. $10 \times 2 = 20$

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Moving Ahead with Multiplication

Connecting Multiplication Methods

✓ **Self-Check: Question 1**

1. John solved 64×32 using all partials. Complete the same problem using the rectangle method. Fill in the blank boxes with the correct numbers.

All- Partials Method

$$\begin{array}{r} 64 \\ \times\ 32 \\ \hline 1800 \\ 120 \\ 120 \\ +\ \ 8 \\ \hline 2048 \end{array}$$

Rectangle Method

	□	4
30	$30 \times$ □ $= 1800$	$30 \times$ □ $= 120$
2	$2 \times$ □ $= 120$	8

1800
120
□
+ 8
2048

Use the Self-Check Question and the menu to choose practice with multiplication methods.

Can I Do This?	Working On It! I could use some extra help.	Getting It! I just need some more practice.	Got It! I'm ready for a challenge.
Make connections between methods.	★Q# 2–3	●Q# 3–4	■Q# 4
Use place value to multiply.	★●■ Multiplication Digits Game		

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★2. Irma solved 12 x 52 using rectangles.

	50	2
10	$50 \times 10 = 500$	$10 \times 2 = 20$
2	$50 \times 2 = 100$	4

500
100
20
+ 4
624

A. Use Irma's rectangle to fill in the blank boxes for the same problem using the all-partials method.

$$\begin{array}{r} 12 \\ \times\ 52 \\ \hline \square \\ \square \\ 20 \\ +\ \ 4 \\ \hline 624 \end{array}$$

B. What numbers did Irma multiply in both methods to get 500?

C. What numbers did Irma multiply in both methods to get 20?

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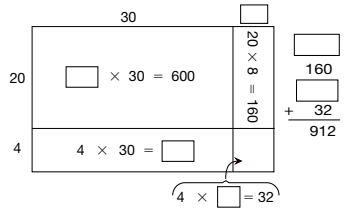
Name _____ Date _____

★●3. Ana solved 38 x 24 using the expanded form method.

$$\begin{array}{r} 38 = 30 + 8 \\ \times\ 24 = 20 + 4 \\ \hline 600 \\ 160 \\ 120 \\ +\ 32 \\ \hline 912 \end{array}$$

A. Using the rectangle method, fill in the blank boxes for the same problem solved above.



B. What numbers did Ana multiply in both problems to get 120?

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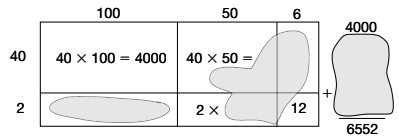
●■4. Professor Peabody's cat had muddy feet and walked across some problems. Fill in the missing spots to show each solution correctly.

A. 156 × 42



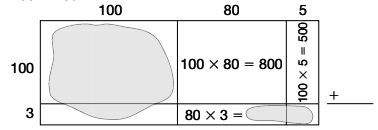
B. 64 × 18

$$\begin{array}{r} 64 = \\ \times\ 18 \\ \hline \end{array} \quad \begin{array}{r} 10 + 8 \\ 600 \\ 40 \\ 32 \\ \hline 1152 \end{array}$$

C.

$$\begin{array}{r} 89 \\ \times\ 46 \\ \hline 360 \\ 480 \\ +\ 54 \\ \hline \end{array}$$

D. 185 × 103



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3. A.

	30	8
20	20 × 30 = 600	20 × 8 = 160
4	4 × 30 = 120	

$$\begin{array}{r} 600 \\ 160 \\ 120 \\ +\ 32 \\ \hline 912 \end{array}$$

$4 \times 8 = 32$

B. $4 \times 30 = 120$

4. A.

	100	50	6
40	40 × 100 = 4000	40 × 50 = 2000	40 × 6 = 240
2	2 × 100 = 200	2 × 50 = 100	12

$$\begin{array}{r} 4000 \\ 2000 \\ 240 \\ 200 \\ +\ 100 \\ 12 \\ \hline 6552 \end{array}$$

B.

$$\begin{array}{r} 64 = 60 + 4 \\ \times\ 18 = 10 + 8 \\ \hline 600 \\ 40 \\ 480 \\ +\ 32 \\ \hline 1152 \end{array}$$

C.

$$\begin{array}{r} 89 \\ \times\ 46 \\ \hline 3200 \\ 360 \\ 480 \\ +\ 54 \\ \hline 4094 \end{array}$$

D.

	100	80	5
100	100 × 100 = 10,000	100 × 80 = 800	100 × 5 = 500
3	100 × 3 = 300	80 × 3 = 240	15

$$\begin{array}{r} 10{,}000 \\ 800 \\ 500 \\ 300 \\ 250 \\ +\ 15 \\ \hline 11{,}355 \end{array}$$

5. 819; 39×21 using a mental math strategy: $40 \times 21 = 800 + 40$ because $40 \times 20 = 800$ and one more 40. But now I need to subtract one 21. $800 + 40 - 21 = 819$.
39×21 using all-partials:

$$\begin{array}{r} 39 \\ \times\ 21 \\ \hline 600 \\ 180 \\ 30 \\ +\ 9 \\ \hline 819 \end{array}$$

6. Yes, I agree with Michael. He made the multiplication problem easier by doing 90×46. He had one 46 too many, so he subtracted.

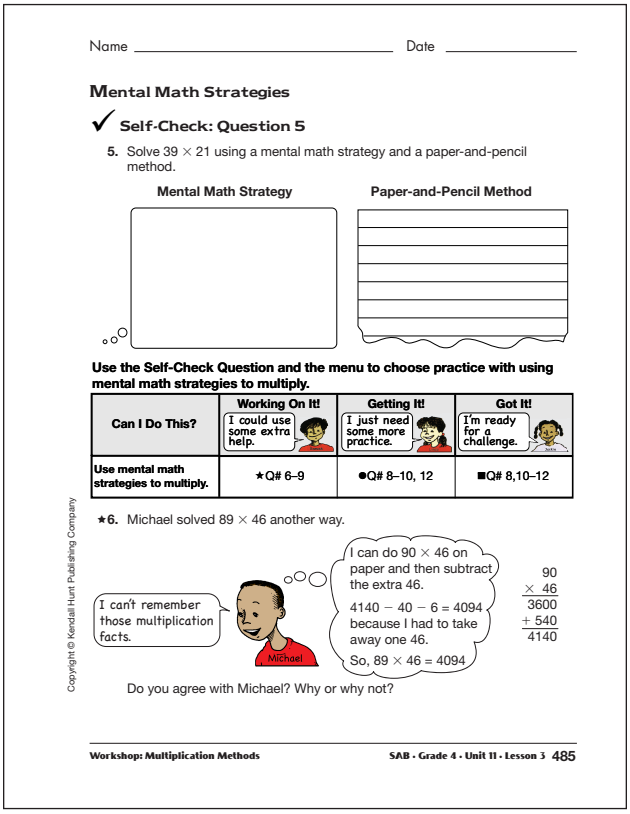
7.
$$\begin{array}{r} 50 \\ \times\ 51 \\ \hline 2500 \\ +\ 50 \\ \hline 2550 \end{array} \qquad \begin{array}{r} 2550 \\ -\ \boxed{51} \\ \hline \boxed{2499} \end{array}$$

Tanya needed to take away one 51 because she added in one too many when she did 50×51 for 49×51.

8. Double 50 to get $\boxed{100}$
$44 \times 100 = 4400$
$44 \times 50 = 4400 \div 2$
$44 \times 50 = 2200$

9. 924; $44 \times 20 = 880$
44×21 will be 44×1 or 44 more,
$880 + 44 = 924$
$44 \times 21 = 924$

10. 14,100; $100 \times 282 = 28{,}200$ so 50×282 is half of 28,200; $50 \times 282 = 14{,}100$



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Mental Math Strategies

✓ **Self-Check: Question 5**

5. Solve 39×21 using a mental math strategy and a paper-and-pencil method.

Mental Math Strategy | **Paper-and-Pencil Method**

Use the Self-Check Question and the menu to choose practice with using mental math strategies to multiply.

Can I Do This?	Working On It! (I could use some extra help.)	Getting It! (I just need some more practice.)	Got It! (I'm ready for a challenge.)
Use mental math strategies to multiply.	★Q# 6–9	●Q# 8–10, 12	■Q# 8,10–12

★**6.** Michael solved 89×46 another way.

I can't remember those multiplication facts. — Michael

I can do 90×46 on paper and then subtract the extra 46.
$4140 - 40 - 6 = 4094$ because I had to take away one 46.
So, $89 \times 46 = 4094$

$$\begin{array}{r} 90 \\ \times\ 46 \\ \hline 3600 \\ +\ 540 \\ \hline 4140 \end{array}$$

Do you agree with Michael? Why or why not?

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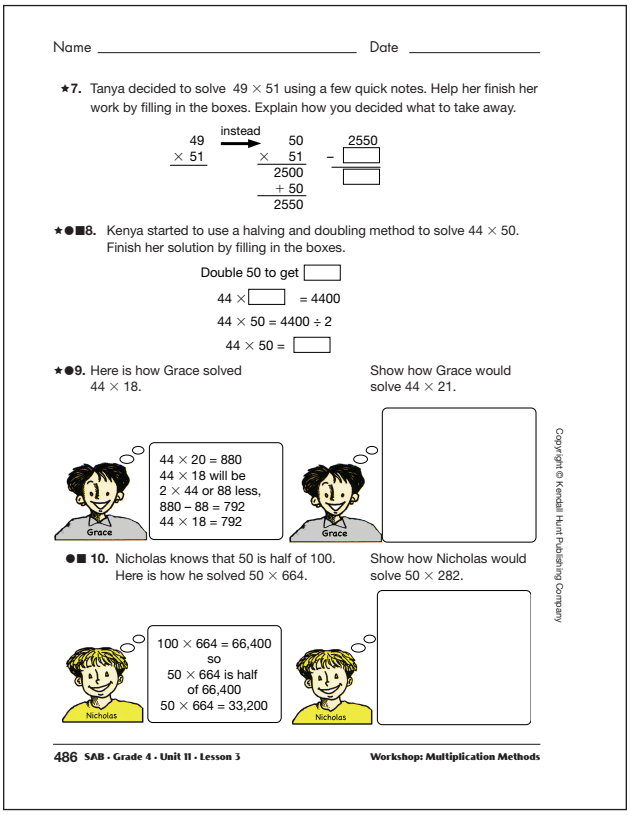

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★**7.** Tanya decided to solve 49×51 using a few quick notes. Help her finish her work by filling in the boxes. Explain how you decided what to take away.

49×51 → instead → 50×51 = 2500 + 50 = 2550 − ☐ = ☐

★●■**8.** Kenya started to use a halving and doubling method to solve 44×50. Finish her solution by filling in the boxes.

Double 50 to get ☐
$44 \times$ ☐ $= 4400$
$44 \times 50 = 4400 \div 2$
$44 \times 50 =$ ☐

★●**9.** Here is how Grace solved 44×18.

Grace: $44 \times 20 = 880$; 44×18 will be 2×44 or 88 less, $880 - 88 = 792$; $44 \times 18 = 792$

Show how Grace would solve 44×21.

●■ **10.** Nicholas knows that 50 is half of 100. Here is how he solved 50×664.

Nicholas: $100 \times 664 = 66{,}400$ so 50×664 is half of 66,400; $50 \times 664 = 33{,}200$

Show how Nicholas would solve 50×282.

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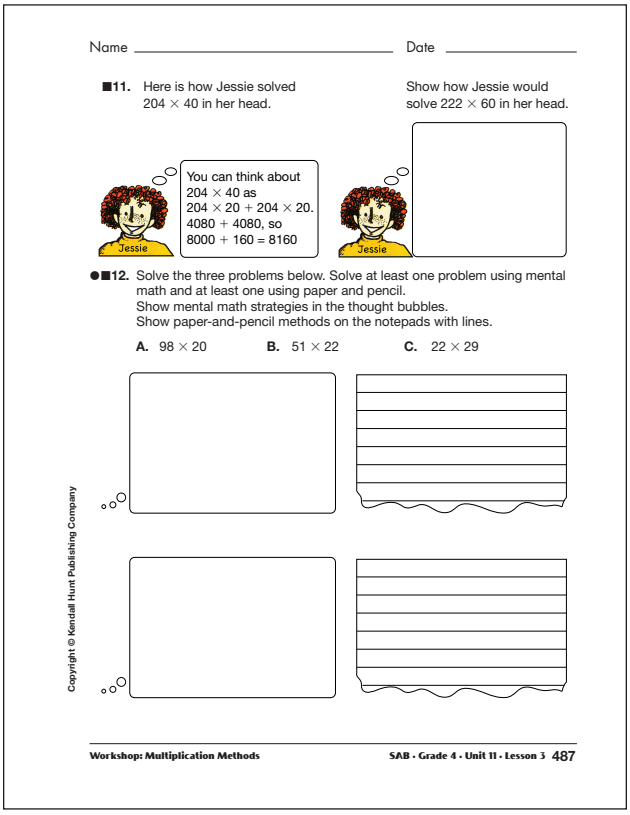

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■11. Here is how Jessie solved 204 × 40 in her head.

Show how Jessie would solve 222 × 60 in her head.

Jessie: You can think about 204 × 40 as 204 × 20 + 204 × 20. 4080 + 4080, so 8000 + 160 = 8160

Jessie

●■12. Solve the three problems below. Solve at least one problem using mental math and at least one using paper and pencil.
Show mental math strategies in the thought bubbles.
Show paper-and-pencil methods on the notepads with lines.

A. 98 × 20 B. 51 × 22 C. 22 × 29

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11. You can think about 222 × 60 as
222 × 30 + 222 × 30
6660 + 6660 = 13,320

12. Strategies will vary. Possible responses:

A. 98 × 20 using a mental math strategy:
100 × 20 = 2000 minus two 20s.
2000 − 20 × 2 = 1960

98 × 20 using all-partials:

$$\begin{array}{r} 98 \\ \times\ \ 20 \\ \hline 1800 \\ +\ 160 \\ \hline 1960 \end{array}$$

B. 51 × 22 using a mental math strategy:
100 × 22 = 2200 so 50 × 22 = 1100.
1100 + 22 = 1122.

51 × 22 using rectangle method:

	50	1
20	50 × 20 = 1000	20
2	50 × 2 = 100	2

1000 + 100 + 20 + 2 = 1122

C. 22 × 29 using a mental math strategy:
22 × 30 = 22 × 3 tens = 66 tens
66 tens = 660
660 − 22 = 638

22 × 29 using expanded form:

$$\begin{array}{rl} 22 & = 20 + 2 \\ \times\ 29 & \quad 20 + 9 \\ \hline & \quad\ 400 \\ & \quad\ \ 40 \\ & \quad\ 180 \\ & \quad\ \ 18 \\ \hline & \quad\ 638 \end{array}$$

13. A. Jessie did not use her estimate to check her answer. 690 is not between 1400 and 2400.

B. No, Jessie's answer is not reasonable.

C. Methods will vary.
$26 \times 75 = 1950$

Using all-partials:

$$\begin{array}{r} 26 \\ \times\ 75 \\ \hline 1400 \\ 420 \\ 100 \\ 30 \\ \hline 1950 \end{array}$$

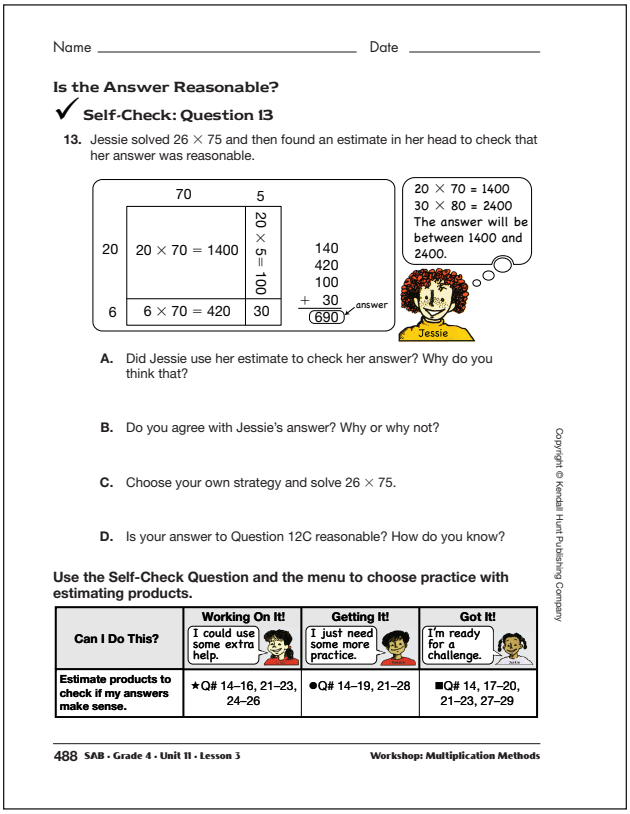
D. I think my calculation is reasonable. 1950 is between 1400 and 2400.

14. A. Romesh did not use his estimate. His estimate was very different from his calculated answer.

B. I do not agree with Romesh's estimate.
$70 \times 40 = 2800$.

C. Round 73 to 70 and 38 to 40.
$70 \times 40 = 2800$.

D. Yes, 2774 is close to 2800.



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Is the Answer Reasonable?

✓ **Self-Check: Question 13**

13. Jessie solved 26×75 and then found an estimate in her head to check that her answer was reasonable.

	70	5
20	$20 \times 70 = 1400$	$20 \times 5 = 100$
6	$6 \times 70 = 420$	30

140
420
100
+ 30
690 answer

$20 \times 70 = 1400$
$30 \times 80 = 2400$
The answer will be between 1400 and 2400.

Jessie

A. Did Jessie use her estimate to check her answer? Why do you think that?

B. Do you agree with Jessie's answer? Why or why not?

C. Choose your own strategy and solve 26×75.

D. Is your answer to Question 12C reasonable? How do you know?

Use the Self-Check Question and the menu to choose practice with estimating products.

Can I Do This?	Working On It! I could use some extra help.	Getting It! I just need some more practice.	Got It! I'm ready for a challenge.
Estimate products to check if my answers make sense.	★Q# 14–16, 21–23, 24–26	●Q# 14–19, 21–28	■Q# 14, 17–20, 21–23, 27–29

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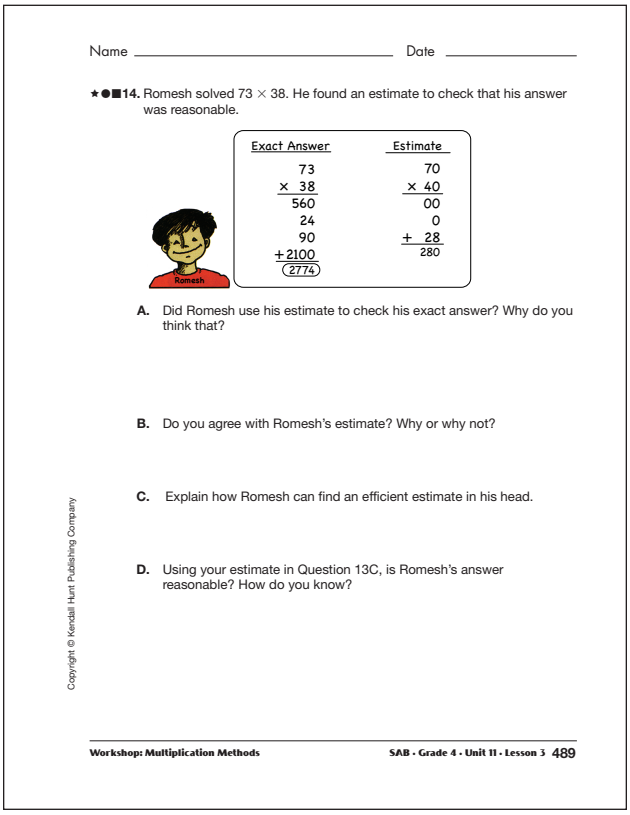

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★●■**14.** Romesh solved 73×38. He found an estimate to check that his answer was reasonable.

Exact Answer	Estimate
73	70
× 38	× 40
560	00
24	0
90	+ 28
+2100	280
2774	

Romesh

A. Did Romesh use his estimate to check his exact answer? Why do you think that?

B. Do you agree with Romesh's estimate? Why or why not?

C. Explain how Romesh can find an efficient estimate in his head.

D. Using your estimate in Question 13C, is Romesh's answer reasonable? How do you know?

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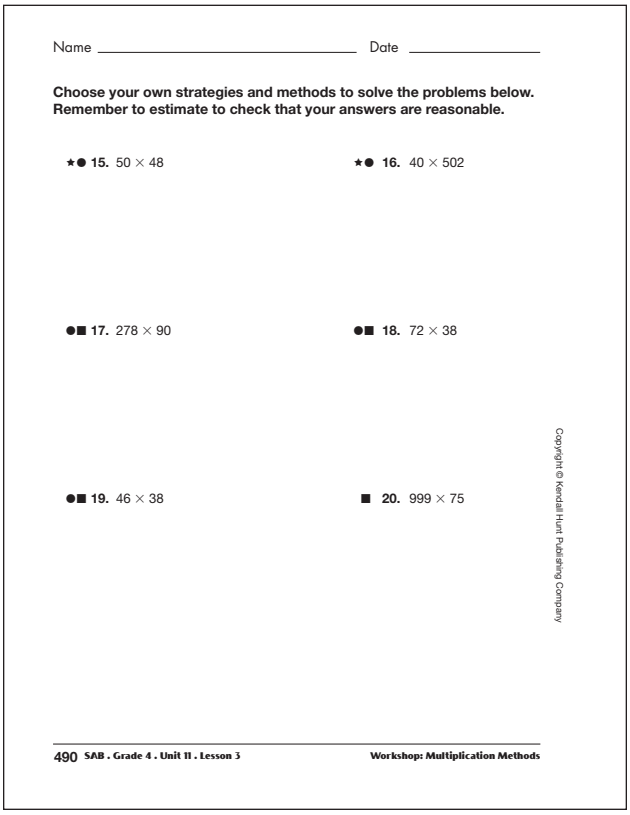

Name _____ Date _____

Choose your own strategies and methods to solve the problems below. Remember to estimate to check that your answers are reasonable.

★● **15.** 50 × 48

★● **16.** 40 × 502

●■ **17.** 278 × 90

●■ **18.** 72 × 38

●■ **19.** 46 × 38

■ **20.** 999 × 75

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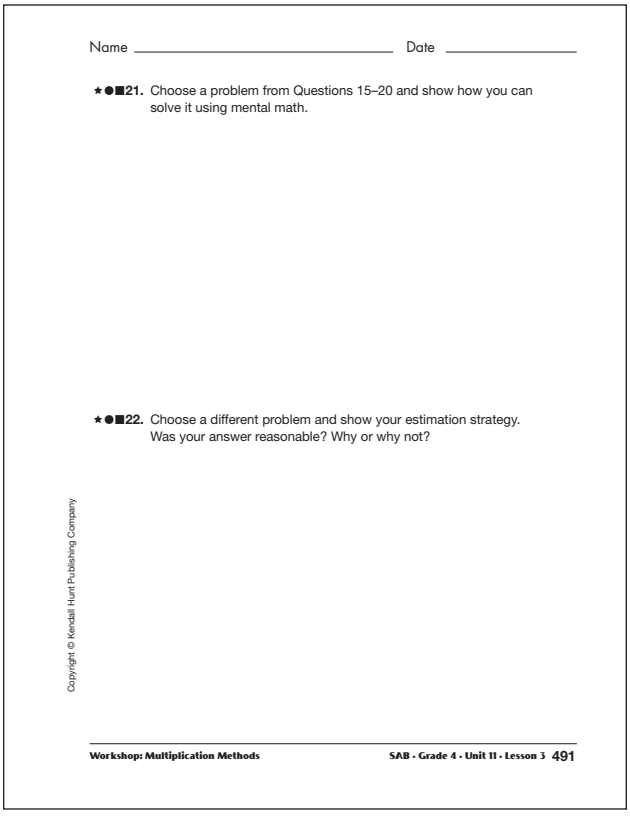

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★●■**21.** Choose a problem from Questions 15–20 and show how you can solve it using mental math.

★●■**22.** Choose a different problem and show your estimation strategy. Was your answer reasonable? Why or why not?

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Strategies will vary. One possible strategy is given for each.

15. 2400; 100 × 48 = 4800 so 50 × 48 = 2400.

16. 20,080; I multiplied 40 and 500 and then added two 40s. 40 × 500 = 20,000. 20,000 + 80 = 20,080.

17. 25,020;

$$\begin{array}{r} 278 \\ \times\ 90 \\ \hline 720 \\ 6300 \\ 18000 \\ \hline 25{,}020 \end{array}$$

18. 2736;

$$\begin{array}{r} 72 \\ \times\ 38 \\ \hline 2100 \\ 60 \\ 560 \\ 16 \\ \hline 2736 \end{array}$$

19. 1748;

$$\begin{array}{r} 46 \\ \times\ 38 \end{array} = \begin{array}{r} 40 + 6 \\ 30 + 8 \\ \hline 1200 \\ 180 \\ 320 \\ 48 \\ \hline 1748 \end{array}$$

20. 74,925; 1000 × 75 = 75,000

$$\begin{array}{r} \\ -\ 75 \\ \hline 74{,}925 \end{array}$$

21. Responses will vary. See Questions 15 and 16 above.

22. Responses will vary.

23. A. Not reasonable; $5 \times 40 = 200$ and $5 \times 30 = 150$; 1525 is not between 200 and 150.

$$\begin{array}{r} 35 \\ \times\ \ 5 \\ \hline 25 \\ 150 \\ \hline 175 \end{array}$$

B. Reasonable; $30 \times 20 = 600$

C. Not reasonable; $30 \times 40 = 1200$ (low estimate); $40 \times 40 = 1600$, $40 \times 50 = 2000$ (high estimate); 180 is too low.

	30	5
40	1200	200
5	150	25

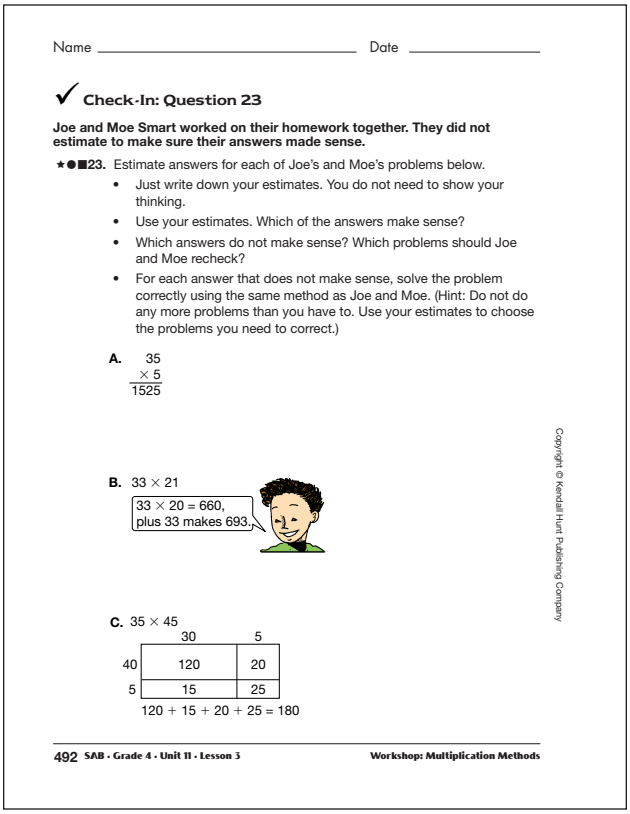
D. Not reasonable; $40 \times 30 = 1200$; the answer should be larger than 1200.

$$\begin{array}{r} 42 \\ \times\ 34 \\ \hline 1200 \\ 60 \\ 160 \\ +\ \ 8 \\ \hline 1428 \end{array}$$

E. Not reasonable; $60 \times 20 = 1200$; 444 is too small.

$$\begin{array}{r} 56 = 50 + 6 \\ \times\ 24 = 20 + 4 \\ \hline 1000 \\ 120 \\ 200 \\ +\ \ 24 \\ \hline 1344 \end{array}$$

F. Reasonable; $40 \times 30 = 1200$; 1073 is only about 125 less.



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✓ **Check-In: Question 23**

Joe and Moe Smart worked on their homework together. They did not estimate to make sure their answers made sense.

★●■**23.** Estimate answers for each of Joe's and Moe's problems below.

- Just write down your estimates. You do not need to show your thinking.
- Use your estimates. Which of the answers make sense?
- Which answers do not make sense? Which problems should Joe and Moe recheck?
- For each answer that does not make sense, solve the problem correctly using the same method as Joe and Moe. (Hint: Do not do any more problems than you have to. Use your estimates to choose the problems you need to correct.)

A. 35 × 5 = 1525

B. 33 × 21

C. 35 × 45

	30	5
40	120	20
5	15	25

120 + 15 + 20 + 25 = 180

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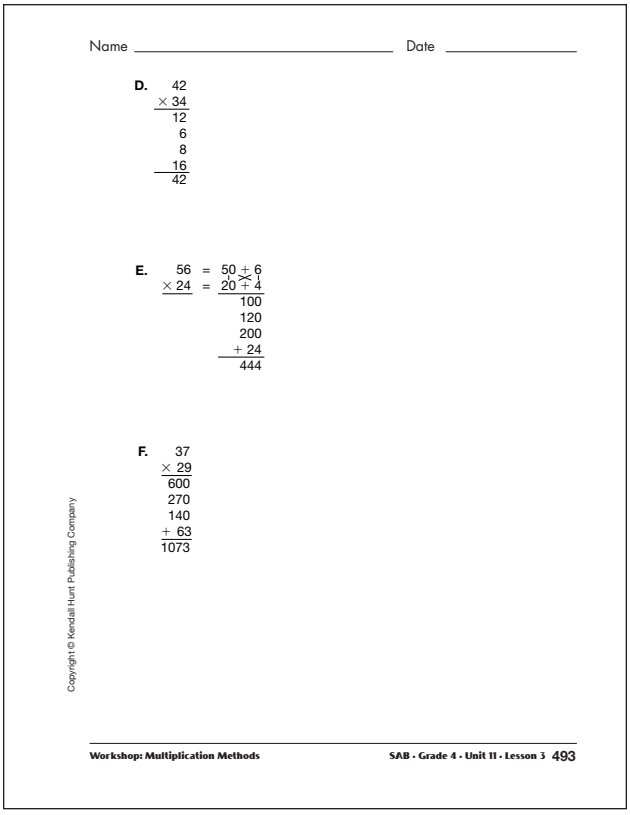

Name _____ Date _____

D.

$$\begin{array}{r} 42 \\ \times\ 34 \\ \hline 12 \\ 6 \\ 8 \\ \underline{16} \\ 42 \end{array}$$

E.

$$\begin{array}{r} 56 = 50 + 6 \\ \times\ 24 = 20 + 4 \\ \hline 100 \\ 120 \\ 200 \\ +\ 24 \\ \hline 444 \end{array}$$

F.

$$\begin{array}{r} 37 \\ \times\ 29 \\ \hline 600 \\ 270 \\ 140 \\ \underline{+\ 63} \\ 1073 \end{array}$$

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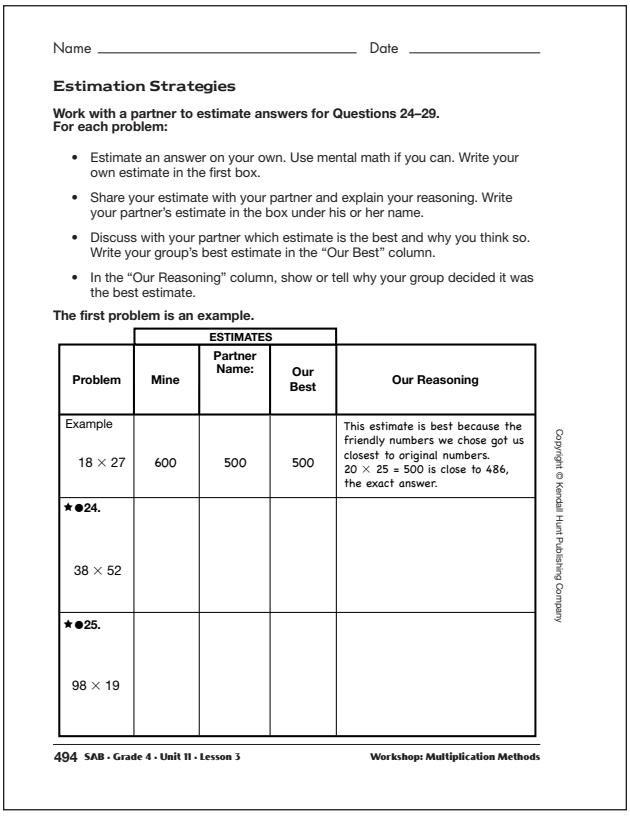

Name _____ Date _____

Estimation Strategies

Work with a partner to estimate answers for Questions 24–29.
For each problem:

- Estimate an answer on your own. Use mental math if you can. Write your own estimate in the first box.
- Share your estimate with your partner and explain your reasoning. Write your partner's estimate in the box under his or her name.
- Discuss with your partner which estimate is the best and why you think so. Write your group's best estimate in the "Our Best" column.
- In the "Our Reasoning" column, show or tell why your group decided it was the best estimate.

The first problem is an example.

	ESTIMATES			
Problem	**Mine**	**Partner Name:**	**Our Best**	**Our Reasoning**
Example 18 × 27	600	500	500	This estimate is best because the friendly numbers we chose got us closest to original numbers. 20 × 25 = 500 is close to 486, the exact answer.
★●24. 38 × 52				
★●25. 98 × 19				

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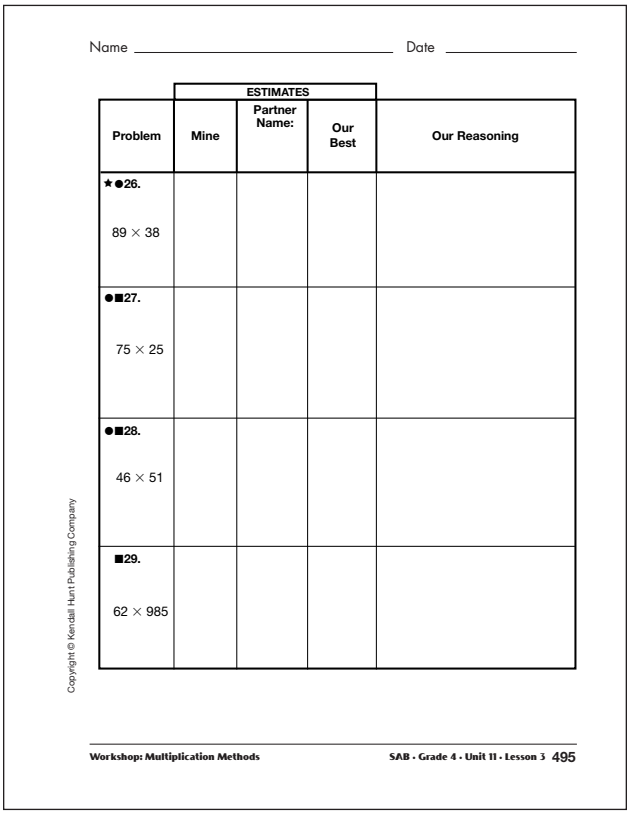

Name _____ Date _____

	ESTIMATES			
Problem	**Mine**	**Partner Name:**	**Our Best**	**Our Reasoning**
★●26. 89 × 38				
●■27. 75 × 25				
●■28. 46 × 51				
■29. 62 × 985				

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For Questions 24–29, estimates and reasoning will vary. Possible estimates are given.

24. $40 \times 50 = 2000$

25. $100 \times 20 = 2000$

26. $90 \times 40 = 3600$

27. $80 \times 20 = 1600$

28. $50 \times 50 = 2500$

29. $62 \times 1000 = 62{,}000$