

### Multiplication Models and Strategies

Professor Peabody is covering the floor of his hallway with square tiles that are 1 foot on each side. The hallway is 32 feet long and 4 feet wide.

32  
4  $32 \times 4 = ?$

- Estimate the number of tiles that are in the hallway.
- Work with a partner to find out how many tiles Professor Peabody will need to cover his hallway.

#### Sharing Solution Strategies

Jason and Richard sketched rectangles to help them solve  $32 \times 4$ .

32 is an even number so I broke it in half.  $16 \times 4 + 16 \times 4$ . To find  $16 \times 4$ , I doubled 16 two times:  $16 + 16 = 32$  and  $32 + 32 = 64$ . To find  $16 \times 4 + 16 \times 4$ , I added  $64 + 64 = 128$ .

32  $32 \times 4 = 16 \times 4 + 16 \times 4$

I broke 32 into tens and ones.  $30 + 2$ . To solve  $30 \times 4 + 2 \times 4$ , first I skip counted by 30s: 30, 60, 90, 120.  $4 \times 2$  is 8.  $120 + 8 = 128$ .

30  $30 \times 4 = 120$   
2  $2 \times 4 = 8$   
 $32 \times 4 = 30 \times 4 + 2 \times 4$

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### Discuss

#### Mara's Way

Mara recorded her work like this:

$$\begin{array}{r} 32 \\ \times 4 \\ \hline 120 \\ + 8 \\ \hline 128 \end{array}$$

32 = 30 + 2 step 1  
120 ← 30 × 4 step 2  
+ 8 ← 2 × 4 step 3  
128 answer

I broke 32 into tens and ones like Richard did. I solved  $30 \times 4 + 2 \times 4$ .

3. How is Mara's way like using the break-apart method with a rectangle?

Richard said, "Let me try to solve  $26 \times 3$  your way."

$$\begin{array}{r} 26 \\ \times 3 \\ \hline 18 \\ + 60 \\ \hline 78 \end{array}$$

26 = 20 + 6  
18 ← 6 × 3  
+ 60 ← 20 × 3

6 × 3 + 20 × 3  
6 × 3  
+  
20 × 3  
bits  
skinnies

4. Is Richard's answer reasonable? How do you know?

Jason recorded his work for  $26 \times 3$  like this:

$$\begin{array}{r} 20 \\ \times 3 \\ \hline 60 \\ + \\ 6 \\ \times 3 \\ \hline 18 \\ \hline 78 \end{array}$$

20 6  
× 3 × 3  
60 + 18 = 78

- How is Jason's way like Richard's way?
- How is it different?

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Multiplication Models and Strategies (SG pp. 370–371)

Questions 1–5

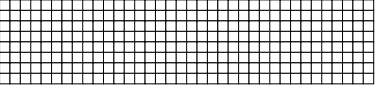
- \* Estimates will vary. Possible estimate:  $30 \times 4 = 120$
  - \* 128 tiles
  - \* Possible response: Both methods break a product into simpler products. Then you add the partial products. It is like breaking a  $32 \times 4$  rectangle into a  $30 \times 4$  rectangle and a  $2 \times 4$  rectangle. When Mara multiplies the 4 by the tens in 32, that matches the large  $4 \times 30$  rectangle. When Mara multiplies the 4 by the ones in 32, that matches the small  $4 \times 2$  rectangle.
  - Richard's answer is reasonable. 26 is close to 25.  $25 \times 3 = 75$ , and 78 is close to that.
  - A.\* Possible response: Jason breaks the 26 into tens and ones,  $20 + 6$ , like Richard does. Then he records partial products like Richard does. He multiplies the tens times 3,  $20 \times 3$ , and records 60. He multiplies the ones times 3,  $6 \times 3$ , and records 18. They both add the partial products,  $60 + 18$ , to get the same product, 78.
- B.\* Possible response: It looks different. Richard's problem is recorded in a vertical fashion. Jason's problems are written side by side. Jason multiplied  $20 \times 3$  first. Richard multiplied  $6 \times 3$  first.



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### Solving Problems Mara's Way

For Questions 1–3, break the rectangles into tens and ones. Write number sentences on the two new rectangles. Then fill in the boxes and blanks to complete the problems.


1. A. 
$$\begin{array}{r} 36 \\ \times 8 \\ \hline 48 \\ + \square \\ \hline \square \end{array}$$
 

\_\_\_\_\_ × \_\_\_\_\_ + \_\_\_\_\_ × \_\_\_\_\_ = \_\_\_\_\_

B. How was 48 computed in the problem above?

C. How does the product in the first box match the rectangles you drew?

D. Explain how you know your answer is reasonable.

2. A. 
$$\begin{array}{r} 28 \\ \times 4 \\ \hline \square \\ + 32 \\ \hline \square \end{array}$$
 

\_\_\_\_\_ × \_\_\_\_\_ + \_\_\_\_\_ × \_\_\_\_\_ = \_\_\_\_\_

B. How did you find the product in the first box?

C. Explain how you know your answer is reasonable.

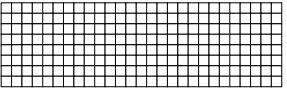
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✓ **Check-In: Questions 3-8**

3. A. 
$$\begin{array}{r} 27 \\ \times 8 \\ \hline 160 \\ + \square \\ \hline \square \end{array}$$
 

\_\_\_\_\_ × \_\_\_\_\_ + \_\_\_\_\_ × \_\_\_\_\_ = \_\_\_\_\_

B. How was 160 computed in the problem above?

C. How does the product in the first box match the rectangles you drew?

D. Explain how you know your answer is reasonable.

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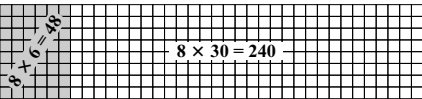
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**Solving Problem's Mara's Way**  
(SAB pp. 531–534)

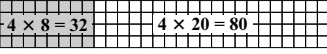
**Questions 1–8**

1. A. 
$$\begin{array}{r} 36 \\ \times 8 \\ \hline 48 \\ + 240 \\ \hline 288 \end{array}$$
 

\_\_\_\_\_ × \_\_\_\_\_ + \_\_\_\_\_ × \_\_\_\_\_ = 240

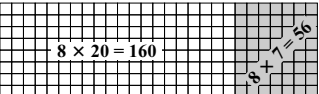
\_\_\_\_\_ × \_\_\_\_\_ + \_\_\_\_\_ × \_\_\_\_\_ = 288

- B.  $8 \times 6 = 48$
- C.  $8 \times 30 = 240$  is like 8 rows of 30 squares in the larger rectangle.
- D. Explanations will vary. Possible response:  $30 \times 8 = 240$  and  $40 \times 8$  is 320. 36 is in between 30 and 40 and 288 is in between 240 and 320 so I know it is a reasonable answer.

2. A. 
$$\begin{array}{r} 28 \\ \times 4 \\ \hline 80 \\ + 32 \\ \hline 112 \end{array}$$
 

\_\_\_\_\_ × \_\_\_\_\_ + \_\_\_\_\_ × \_\_\_\_\_ = 112

- B.  $20 \times 4 = 80$
- C. Explanations will vary. Possible response: 4 quarters is  $25¢ \times 4 = 100¢$ .  $28 \times 4$  should be a little more so 112 is reasonable.

3. A. 
$$\begin{array}{r} 27 \\ \times 8 \\ \hline 160 \\ + 56 \\ \hline 216 \end{array}$$
 

\_\_\_\_\_ × \_\_\_\_\_ + \_\_\_\_\_ × \_\_\_\_\_ = 216

- B.  $8 \times 20 = 160$
- C. 56 is the same as 7 squares in each of the 8 rows in the smaller rectangle.
- D. Explanations will vary. Possible response: 27 is close to 30.  $30 \times 8 = 240$ .  $27 \times 8$  should be a little less than 240, so 216 is a reasonable answer.

# Answer Key • Lesson 3: Multiplication Models and Strategies

4.  $36 \quad 30 \times 4 = 120$  and  $40 \times 4 = 160$ .  
 $\begin{array}{r} \times 4 \\ 36 \\ \hline 144 \end{array}$  So 144 is reasonable because it is  
 24 between my estimates.

$$\begin{array}{r} + 120 \\ 144 \end{array}$$

5.  $20 \quad 7$   
 $\begin{array}{r} \times 8 \\ 20 \\ \hline 160 \end{array} + \begin{array}{r} \times 8 \\ 7 \\ \hline 56 \end{array} = 216$

The answer is close to  $25 \times 8 = 200$ . So 216 is reasonable.

6.  $72$  The answer is close to  $70 \times 4 = 280$ .  
 $\begin{array}{r} \times 4 \\ 72 \\ \hline 288 \end{array}$  So 288 is reasonable.

$$\begin{array}{r} + 8 \\ 288 \end{array}$$

7.  $40 \quad 2$   
 $\begin{array}{r} \times 5 \\ 40 \\ \hline 200 \end{array} + \begin{array}{r} \times 5 \\ 2 \\ \hline 10 \end{array} = 210$

The answer is close to my estimate of  $40 \times 5 = 200$ .

8.  $64 \quad 60 \times 7 = 420$ . That is close to 448.

$$\begin{array}{r} \times 7 \\ 64 \\ \hline 448 \end{array}$$

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Solve the following problems and show your work. Then show how you know your answer is reasonable. You can sketch rectangles to help. See Jason's example.

**Example**  
 $23 \times 4$

$$\begin{array}{r} 23 \\ \times 4 \\ \hline 80 \\ + 12 \\ \hline 92 \end{array}$$

$4 \quad \begin{array}{|c|c|} \hline 20 & 3 \\ \hline \end{array}$

$20 \times 4 = 80$   
 $3 \times 4 = 12$   
 $20 \times 4 + 3 \times 4 = 92$



Jason

$20 \times 4 = 80$  and  
 $25 \times 4 = 100$  so  
 $23 \times 4$  will be more  
 than 80 but less  
 than 100.

4.  $36 \times 4$

5.  $27 \times 8$

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6.  $72 \times 4$

7.  $42 \times 5$

8.  $64 \times 7$

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