Student Guide

Paper-and-Pencil Multiplication

Questions 1–11 (SG pp. 158–160)

1. $3 \times 40 = 120$
2. $3 \times 6 = 18$
3. **A.** They are alike because in both methods you break 46 into $40 + 6$. Then, you multiply 3×40 and 3×6. Then add the products together $120 + 18 = 138$.

   B. They are different because in the expanded form you show how to break 46 into $40 + 6$, then multiply and add across. In the all-partials method, you don't show the $40 + 6$. You just think 3×40 and 3×6 in your head. You write 120 and 18 so you add them up and down.

4. 91
5. 12
6. 200
7. **A.** $27 \times 6 = 42 + 120 = 162$

   B. $56 \times 3 = 18 + 150 = 168$

   C. $28 \times 3 = 60 + 24 = 84$

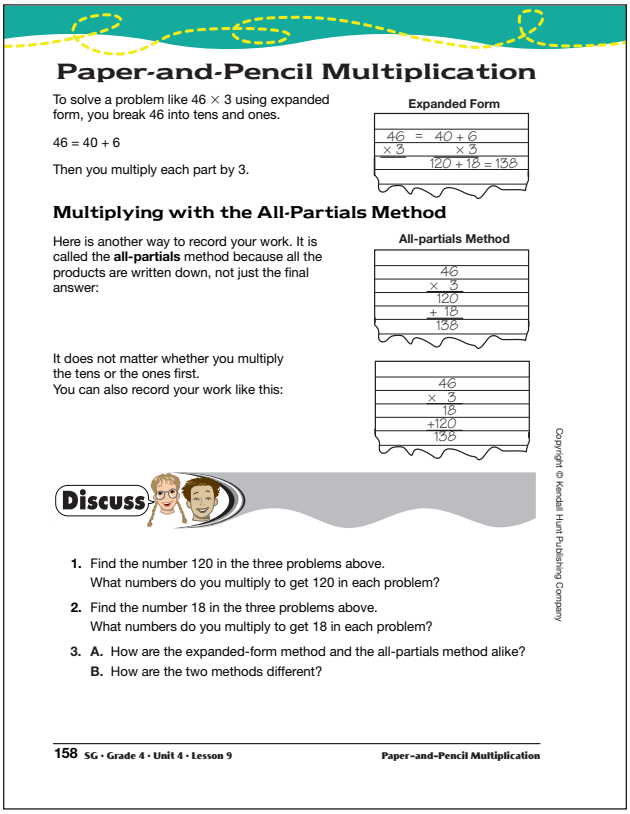
   D. $65 \times 6 = 360 + 30 = 390$

   E. $83 \times 7 = 560 + 21 = 581$

   F. $76 \times 9 = 54 + 630 = 684$

   G. $78 \times 6 = 420 + 48 = 468$

   H. $67 \times 4 = 28 + 240 = 268$
8. **A.** 70 **B.** 70 **C.** 488 **D.** 378
   E. 231 **F.** 460 **G.** 132 **H.** 268
   I. 675 **J.** 672



Paper-and-Pencil Multiplication

To solve a problem like 46×3 using expanded form, you break 46 into tens and ones.

$46 = 40 + 6$

Then you multiply each part by 3.

Expanded Form

$46 = 40 + 6$
$\times 3 \quad \times 3$
$120 + 18 = 138$

Multiplying with the All-Partials Method

Here is another way to record your work. It is called the **all-partials** method because all the products are written down, not just the final answer:

All-partials Method

46
× 3
120
+ 18
138

It does not matter whether you multiply the tens or the ones first.
You can also record your work like this:

46
× 3
18
+120
138

Discuss

1. Find the number 120 in the three problems above.
   What numbers do you multiply to get 120 in each problem?
2. Find the number 18 in the three problems above.
   What numbers do you multiply to get 18 in each problem?
3. **A.** How are the expanded-form method and the all-partials method alike?
   B. How are the two methods different?

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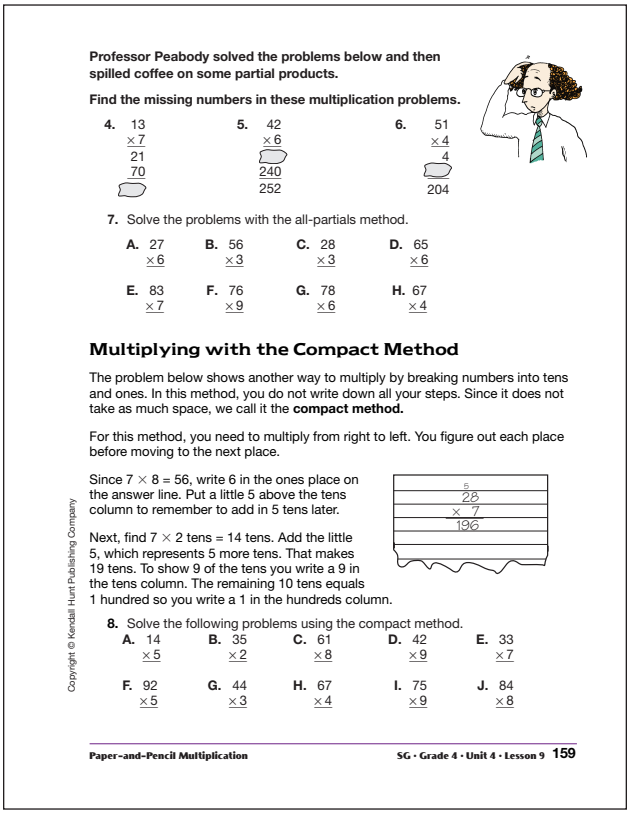

Professor Peabody solved the problems below and then spilled coffee on some partial products.

Find the missing numbers in these multiplication problems.

4. 13 × 7 = 21 + 70 = 252
5. 42 × 6 = [ ]40 + 240 = 252
6. 51 × 4 = 4 + [ ]200 = 204

7. Solve the problems with the all-partials method.

   A. 27 × 6 **B.** 56 × 3 **C.** 28 × 3 **D.** 65 × 6
   E. 83 × 7 **F.** 76 × 9 **G.** 78 × 6 **H.** 67 × 4

Multiplying with the Compact Method

The problem below shows another way to multiply by breaking numbers into tens and ones. In this method, you do not write down all your steps. Since it does not take as much space, we call it the **compact method.**

For this method, you need to multiply from right to left. You figure out each place before moving to the next place.

Since $7 \times 8 = 56$, write 6 in the ones place on the answer line. Put a little 5 above the tens column to remember to add in 5 tens later.

Next, find 7×2 tens = 14 tens. Add the little 5, which represents 5 more tens. That makes 19 tens. To show 9 of the tens you write a 9 in the tens column. The remaining 10 tens equals 1 hundred so you write a 1 in the hundreds column.

5
28
× 7
196

8. Solve the following problems using the compact method.

   A. 14 × 5 **B.** 35 × 2 **C.** 61 × 8 **D.** 42 × 9 **E.** 33 × 7
   F. 92 × 5 **G.** 44 × 3 **H.** 67 × 4 **I.** 75 × 9 **J.** 84 × 8

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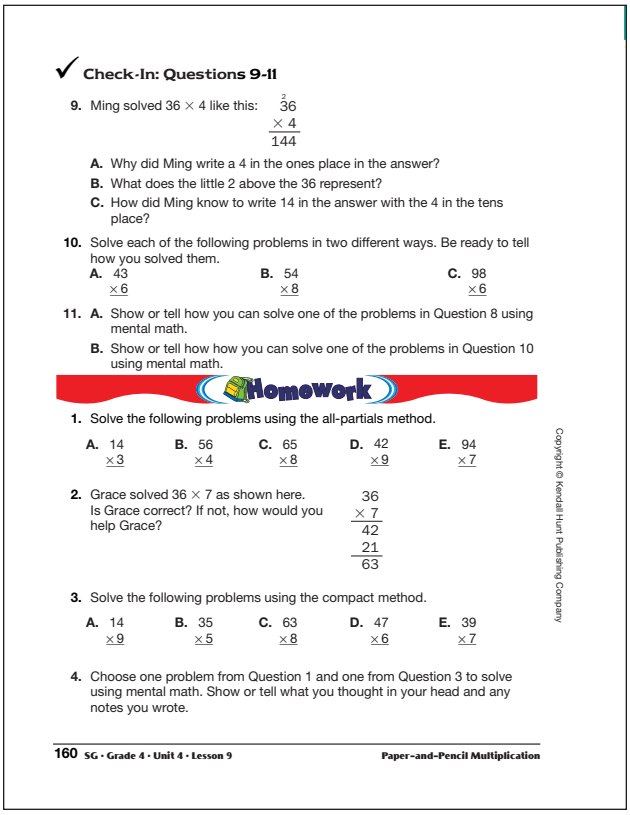

✓ Check-In: Questions 9–11

9. Ming solved 36 × 4 like this:

$$\begin{array}{r} \overset{2}{3}6 \\ \times\ 4 \\ \hline 144 \end{array}$$

   A. Why did Ming write a 4 in the ones place in the answer?
   B. What does the little 2 above the 36 represent?
   C. How did Ming know to write 14 in the answer with the 4 in the tens place?

10. Solve each of the following problems in two different ways. Be ready to tell how you solved them.
   A. 43 × 6 B. 54 × 8 C. 98 × 6

11. A. Show or tell how you can solve one of the problems in Question 8 using mental math.
   B. Show or tell how how you can solve one of the problems in Question 10 using mental math.

Homework

1. Solve the following problems using the all-partials method.
   A. 14 × 3 B. 56 × 4 C. 65 × 8 D. 42 × 9 E. 94 × 7

2. Grace solved 36 × 7 as shown here. Is Grace correct? If not, how would you help Grace?

$$\begin{array}{r} 36 \\ \times\ 7 \\ \hline 42 \\ 21 \\ \hline 63 \end{array}$$

3. Solve the following problems using the compact method.
   A. 14 × 9 B. 35 × 5 C. 63 × 8 D. 47 × 6 E. 39 × 7

4. Choose one problem from Question 1 and one from Question 3 to solve using mental math. Show or tell what you thought in your head and any notes you wrote.

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9. A. The 4 represents the four ones from 6 × 4.

B. The 2 represents the two tens from 6 × 4.

C. Because 4 × 3 tens is 12 tens, plus the two tens from 6 × 4.

10. A. 258 **B.** 432 **C.** 588

11. A. Possible response for 8C:
60 × 8 = 480 and 1 × 8 = 8; 480 + 8 = 488

B. Possible response for Question 10C:
100 × 6 – 2 × 6 = 588

Homework (SG p. 160)

Questions 1–4

1. A.

$$\begin{array}{r} 14 \\ \times\ 3 \\ \hline 30 \\ +\ 12 \\ \hline 42 \end{array}$$

B.

$$\begin{array}{r} 56 \\ \times\ 4 \\ \hline 24 \\ +\ 200 \\ \hline 224 \end{array}$$

C.

$$\begin{array}{r} 65 \\ \times\ 8 \\ \hline 480 \\ +\ 40 \\ \hline 520 \end{array}$$

D.

$$\begin{array}{r} 42 \\ \times\ 9 \\ \hline 360 \\ +\ 18 \\ \hline 378 \end{array}$$

E.

$$\begin{array}{r} 94 \\ \times\ 7 \\ \hline 630 \\ +\ 28 \\ \hline 658 \end{array}$$

2. Grace is incorrect.

$$\begin{array}{rl} 36 & \\ \times\ 7 & \\ \hline 42 & (7 \times 6) \\ +\ 210 & (7 \times 30) \\ \hline 252 & \end{array}$$

3. A. 126 **B.** 175 **C.** 504
D. 282 **E.** 273

4. Answers may vary.

Possible response for 1B:
50 × 4 = 200; 6 × 4 = 24
200 + 24 = 224

Possible response for 3E:
For 39 × 7, I think 39 is close to 40.
40 × 7 = 280, 1 × 7 = 7; 280 − 7 = 273

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