Unit 6, Lesson 9

Recording Partial Products: One-Digit and Three- or Four-Digit Factors

Let's analyze and try an algorithm that uses partial products.

Warm-up

Which Three Go Together: Expressions Galore

Which 3 go together?

A

$$7 \times 50$$

B

$$(3 \times 50) + (4 \times 50)$$

C

$$(5 \times 10) \times 7$$

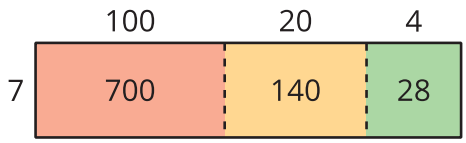
D

$$50 + 50 + 50 + 50 + 50 + 50 + 50$$

Activity 1

An Algorithm for Noah

1. Noah draws a diagram and writes expressions to multiply 2 numbers.



700 + 140 + 28 = 868

7×124
$7 \times (100 + 20 + 4)$
$(7 \times 100) + (7 \times 20) + (7 \times 4)$
$700 + 140 + 28$

How does each expression represent Noah's diagram?

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_____

2. Noah learns another way to record the multiplication.

Step 1

$$\begin{array}{r} 124 \\ \times \quad 7 \\ \hline 28 \end{array} \qquad 7 \times 4$$

Step 2

$$\begin{array}{r} 124 \\ \times \quad 7 \\ \hline 28 \\ 140 \end{array} \qquad \begin{array}{l} 7 \times 4 \\ 7 \times 20 \end{array}$$

Step 3

$$\begin{array}{r} 124 \\ \times \quad 7 \\ \hline 28 \\ 140 \\ +\ 700 \\ \hline 868 \end{array} \qquad \begin{array}{l} 7 \times 4 \\ 7 \times 20 \\ 7 \times 100 \end{array}$$

Make sense of each step of the calculations and record your thoughts.

3. Complete the diagram to find the value of 384×5. Use Noah's recording method to check your work.

$$\begin{array}{r} 3\ 8\ 4 \\ \times \qquad 5 \\ \hline \\ \\ \\ + \\ \hline \end{array}$$

5×4

5×80

5×300

Activity 2

Try an Algorithm with Partial Products

Noah and Mai want to find the value of $6 \times 2{,}947$. They record their steps in different ways.

Noah

$$\begin{array}{rrrrrr} & & 2, & 9 & 4 & 7 \\ \times & & & & & 6 \\ \hline & & & & 4 & 2 \\ & & & 2 & 4 & 0 \\ & & 5, & 4 & 0 & 0 \\ + & 1 & 2, & 0 & 0 & 0 \\ \hline \end{array}$$

Mai

$$\begin{array}{rrrrrr} & & 2, & 9 & 4 & 7 \\ \times & & & & & 6 \\ \hline & 1 & 2, & 0 & 0 & 0 \\ & & 5, & 4 & 0 & 0 \\ & & & 2 & 4 & 0 \\ + & & & & 4 & 2 \\ \hline \end{array}$$

1. How are these notations alike? How are they different?

   _____

   _____

   _____

   _____

2. Use a diagram to show what each of the partial products 42, 240, 5,400 and 12,000 represent. Then find the value of $6 \times 2{,}947$.

3. Find the value of each expression. Use the algorithm that Noah used for at least one expression. Show your thinking using diagrams, symbols, or other representations.

   a. $4 \times 5{,}342$

   b. 7×983