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 One Doesn't Belong: Expressions Galore

Which one doesn't belong?

A. 7×50

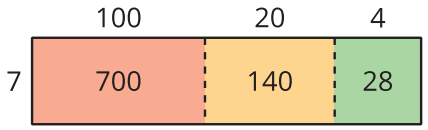
B. $(3 \times 50) + (4 \times 50)$

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

D. $50 + 50 + 50 + 50 + 50 + 50 + 50$

9.1: An Algorithm for Noah

1. Noah drew a diagram and wrote expressions to show his thinking as he multiplied two numbers.



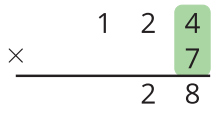
700 + 140 + 28 = 868

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? Be prepared to share your thinking with a partner.

2. Later, Noah learned another way to record the multiplication, as shown here.

Step 1

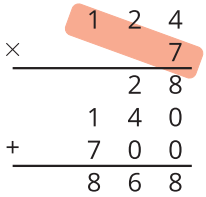


7×4

Step 2

7×4
7×20

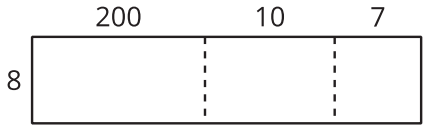
Step 3

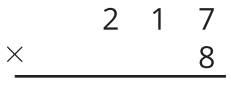


7×4
7×20
7×100

Make sense of each step of the calculations and record your thoughts. Be prepared to explain Noah's steps to a partner.

3. Complete the diagram to find the value of 217×8. Use Noah's recording method to check your work.





8×7

8×10

+

8×200

9.2: Try an Algorithm with Partial Products

Noah and Mai want to find the value of $8 \times 3{,}419$. They recorded their steps in different ways, as shown.

Noah

$$
\begin{array}{rrrrr}
 & 3, & 4 & 1 & 9 \\
\times & & & & 8 \\
\hline
 & & & 7 & 2 \\
 & & & 8 & 0 \\
 & 3, & 2 & 0 & 0 \\
+ \; 2 & 4, & 0 & 0 & 0 \\
\hline
\end{array}
$$

Mai

$$
\begin{array}{rrrrr}
 & 3, & 4 & 1 & 9 \\
\times & & & & 8 \\
\hline
2 & 4, & 0 & 0 & 0 \\
 & 3, & 2 & 0 & 0 \\
 & & & 8 & 0 \\
+ & & & 7 & 2 \\
\hline
\end{array}
$$

1. How are Mai's and Noah's notation alike? How are they different?

2. Use a diagram to show what each of the partial products 72, 80, 3,200 and 24,000 represent. Then, find the value of $8 \times 3{,}419$.

3. Find the value of each expression. For at least one expression, use the algorithm that Noah used. Show your reasoning.

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

   b. 7×983