



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

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



$$\begin{aligned}7 \times 124 \\7 \times (100 + 20 + 4) \\(7 \times 100) + (7 \times 20) + (7 \times 4) \\700 + 140 + 28\end{aligned}$$

$$700 + 140 + 28 = 868$$

How does each expression represent Noah's diagram?

- Noah learns another way to record the multiplication.

Step 1

$$\begin{array}{r} 1 & 2 & 4 \\ \times & & 7 \\ \hline 2 & 8 \end{array}$$

7×4

Step 2

$$\begin{array}{r} 1 & 2 & 4 \\ \times & & 7 \\ \hline 2 & 8 \\ 1 & 4 & 0 \end{array}$$

7×4

7×20

Step 3

$$\begin{array}{r} 1 & 2 & 4 \\ \times & & 7 \\ \hline 2 & 8 \\ 1 & 4 & 0 \\ + & & 7 & 0 & 0 \\ \hline 8 & 6 & 8 \end{array}$$

7×4

7×20

7×100

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.

3 8 4
× 5

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

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

Mai

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

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