Mysterious Multiplication 3

Ask students to calculate 32x46. Ask them to reverse the digits in each number and calculate 23x64.

Ask students to calculate 34x86, then reverse the digits and calculate 43x68.

Ask them to find other combinations where you will get the same pattern.

Discussion, Suggestions, Possible Solutions

32 x 46 = 23 x 64 = 1472
34 x 86 = 43 x 68 = 2924

With these number combinations, the products you obtain are the same after you reverse the digits in each factor. Other possible combinations will include 32 x 69 and 46 x 96.

Extension:
Explain why the product remains the same after we switch the digits of each factor when the product of tens digits and the product of ones digits are equal.

For this problem, it might be helpful if you calculate each product by listing all four partial products explicitly, instead of using the conventional algorithm. For example,

\[
\begin{array}{c c c}
3 & 2 \\
\times & 4 & 6 \\
\hline
1 & 2 \\
1 & 8 & 0 \\
8 & 0 \\
1 & 2 & 0 & 0 \\
\hline
1 & 4 & 7 & 2
\end{array}
\]
You notice that the partial products are identical, and the order of the two middle partial products are reversed.

Since the first partial product (12) is the product of the ones digits, this observation suggests that the number combinations for which this pattern exists must be such that the product of the ones digits and the product of the tens digits must be the same.