

Puzzle of the Week

Extreme Products – 1

THE CHALLENGE: 1) Using the digits from 1 to 9, each at most once, make two 2-digit numbers whose product is as large as possible. 2) Also, using the digits from 1 to 9, each at most once, make two 2-digit numbers whose product is as small as possible.

$$\begin{array}{c} \square \square \times \square \square \\ 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \end{array}$$

EXPLORATION: Can you apply what you learned for multiplying two numbers to do this with multiplying three two-digit numbers? Can you think of other interesting variations?



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Extreme Products – 1 – Notes

THE CHALLENGE: This is small enough and obvious enough, that not much experimenting or analysis is needed.

To make the product large we want to have tens digits that are 8 and 9. The only remaining question can be settled by multiplying: should it be $97 \times 86 = 8342$ or $96 \times 87 = 8352$.

Similar logic for making the product small produces a choice of $13 \times 24 = 312$ or $14 \times 23 = 322$.

EXPLORATION: For three numbers, the analysis is similar.

To make the product large, we have first digits of 7, 8, and 9, and second digits of 4, 5, and 6. The only question is how to combine them. Some experimentation verifies what you would expect from the two number case: the largest value comes from $94 \times 85 \times 76$.

Similarly, the smallest value comes from $14 \times 25 \times 36$.

A natural variation of this problem is to look at three-digit numbers. We will do this in the “Extreme Products - 2” puzzle.