

# Problem of the Week

## Grade 5 and 6

### How High Can You Go?

#### Solution

### Problem

Welcome to the “Not Just a Noether Game Show!” In each of Game 1 and Game 2, the goal is to arrange the digits 4, 5, 6, 7, 8, 9 in the given boxes to achieve the greatest possible answer, using each digit once. Check with your friends to see how well you did!


**NOT JUST A NOETHER GAME SHOW**

**Game 1**


+


**Game 2**


-

**Digits**

4	5	6
7	8	9

### Solution

The greatest possible sum is 1839.

In order to get the greatest sum, we put the largest digits in the column with the largest place value, the next largest digits in the next column, and so on.

The greatest sum is 1839, from any arrangement of digits with 9 and 8 in the hundreds column, 7 and 6 in the tens column, and 5 and 4 in the units column.

For example,  $975 + 864 = 1839$ . It turns out that there are eight possible ways to arrange the digits so that the maximum sum 1839 is obtained.

The greatest possible difference is 531.

In order to get the greatest difference, we make the top three-digit number (called the *minuend*) as large as possible and the bottom three-digit number (called the *subtrahend*) as small as possible.

The largest possible three-digit number that can be made from these digits is 987 (by putting the largest digit in the hundreds place, the next largest digit in the tens place, and so on). In a similar way, the smallest possible three-digit number that can be made is 456. Although we can find the sum in eight different ways, there is only one way to find the largest difference.

Therefore, the greatest difference is  $987 - 456 = 531$ .

