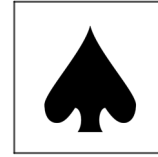# Problem of the Week
Problem C and Solution
Order Three Cards

Problem

Three playing cards are placed in a row, from left to right. Each card is of a different suit. One card is a diamond ($\diamondsuit$), one card is a heart ($\heartsuit$), and one card is a spade ($\spadesuit$). The number on each card is also different. One card is a 3, one card is a 7, and one card is a 9.

Using the following clues, determine the exact order of the cards, from left to right, including the suit and number.

1. The diamond is somewhere to the right of the spade.

2. The 7 is somewhere to the left of the spade.

3. The 9 is somewhere to the right of the 3.

Solution

There are six ways to order the suits:

$$(\diamondsuit, \heartsuit, \spadesuit), \ (\diamondsuit, \spadesuit, \heartsuit), \ (\heartsuit, \diamondsuit, \spadesuit), \ (\heartsuit, \spadesuit, \diamondsuit), \ (\spadesuit, \diamondsuit, \heartsuit), \ \text{and} \ (\spadesuit, \heartsuit, \diamondsuit).$$

The first clue tells us that the diamond is somewhere to the right of the spade. We can eliminate the first three orders from the above list since the diamond is to the left of the spade in each case. There are now only three possible ways to order the suits:

$$(\heartsuit, \spadesuit, \diamondsuit), \ (\spadesuit, \diamondsuit, \heartsuit), \ \text{and} \ (\spadesuit, \heartsuit, \diamondsuit).$$

The second clue says that the 7 is somewhere to the left of the spade. This means that the spade cannot be the leftmost card. This eliminates the last two possibilities from the above list. The only possibility is $(\heartsuit, \spadesuit, \diamondsuit)$ and the 7 must be the 7 of hearts giving us $(7\heartsuit, \spadesuit, \diamondsuit)$.

The third clue tells us that the 9 is somewhere to the right of the 3. With only two spots to decide, we can conclude that the 9 must be in the rightmost (third) spot and the last two cards are the 3 of spades and the 9 of diamonds. This gives us $(7\heartsuit, 3\spadesuit, 9\diamondsuit)$.

Therefore, the cards are placed in the following order from left to right:
7 of hearts, then 3 of spades, and then 9 of diamonds.