



# Problem of the Week

## Problem C and Solution

### Own the Podium

#### Problem

Christina, Martha, Natalie and Silvia are figure skaters who competed in the Winter Olympics.

Silvia, Martha, Christina and Natalie each finished in first, second, third or fourth in the figure skating event. There were no ties. Silvia, Martha, Christina and Natalie are also from different countries. One is from Canada, one is from China, one is from Croatia and one is from New Zealand. Using the following clues, determine who placed first, second, third and fourth, and for which country each athlete was competing.

1. Christina did not beat Martha in the competition.
2. The Croatian athlete did not finish in first place.
3. The athlete from New Zealand finished in fourth place.
4. Silvia finished ahead of the competitor from China.
5. Christina competes for a country starting with 'C'.
6. Silvia is not from Canada.

#### Solution

In our solution, we will go through each clue and update the table based on the information in the clue. We will put an X in a cell if the combination indicated by the row and column for that cell is not possible, or a ✓ if it must be true.

In clue (1), we are given that Christina did not beat Martha. In other words, Martha beat Christina. Therefore, Christina could not have finished first and Martha could not have finished fourth. We can put X's in the corresponding cells.

In clue (2), we are given that the Croatian athlete did not come in first. We can put an X in the corresponding cell. The table is updated below.

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	Canada	China	Croatia	New Zealand
Christina	X							
Martha				X				
Natalie								
Silvia								
Canada								
China								
Croatia	X							
New Zealand								





In clue (3), we are given that the athlete from New Zealand finished fourth. We can put a ✓ in the corresponding cell. Since there were no ties, we can put X's in the cells corresponding to the athletes from Canada, China and Croatia finishing fourth and in the cells corresponding to the athlete from New Zealand finishing first, second and third. We also already know that Martha did not finish fourth, so Martha must not be from New Zealand. We can put an X in the corresponding cell. The table is updated below.

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	Canada	China	Croatia	New Zealand
Christina	X							
Martha				X				X
Natalie								
Silvia								
Canada				X				
China				X				
Croatia	X			X				
New Zealand	X	X	X	✓				

In clue (4), we are given that Silvia finished ahead of the competitor from China. This tells us that Silvia did not finish in fourth and the Chinese competitor did not finish first. It also tells us that Silvia is not Chinese. Since Silvia is not in fourth place and we already know the competitor in fourth place is also from New Zealand, Silvia must not be from New Zealand. The table is updated below.

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	Canada	China	Croatia	New Zealand
Christina	X							
Martha				X				X
Natalie								
Silvia				X		X		X
Canada				X				
China	X			X				
Croatia	X			X				
New Zealand	X	X	X	✓				

We can now see that the Canadian finished in first place. We put a ✓ in the cell corresponding to the Canadian finishing first, and X's in the cells corresponding to the Canadian finishing second and third. Also, since Christina did not finish first, she must not be from Canada.

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	Canada	China	Croatia	New Zealand
Christina	X				X			
Martha				X				X
Natalie								
Silvia				X		X		X
Canada	✓	X	X	X				
China	X			X				
Croatia	X			X				
New Zealand	X	X	X	✓				





In clue (5), we are given that Christina competes for a country starting with a ‘C’. Therefore, Christina does not compete for New Zealand. Since we already know that the competitor from New Zealand finished in fourth place, we can also conclude that Christina did not finish in fourth place. The table is updated below.

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	Canada	China	Croatia	New Zealand
Christina	X			X	X			X
Martha				X				X
Natalie								
Silvia				X		X		X
Canada	✓	X	X	X				
China	X			X				
Croatia	X			X				
New Zealand	X	X	X	✓				

We can now see that Natalie must have finished in fourth place and must be from New Zealand. Therefore, Natalie did not finish in first, second or third, and she does not compete for Canada, China or Croatia. The table is updated with the corresponding ✓’s and X’s below.

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	Canada	China	Croatia	New Zealand
Christina	X			X	X			X
Martha				X				X
Natalie	X	X	X	✓	X	X	X	✓
Silvia				X		X		X
Canada	✓	X	X	X				
China	X			X				
Croatia	X			X				
New Zealand	X	X	X	✓				

In clue (6), we are given that Silvia is not from Canada. We add the corresponding X. The table is updated below.

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	Canada	China	Croatia	New Zealand
Christina	X			X	X			X
Martha				X				X
Natalie	X	X	X	✓	X	X	X	✓
Silvia				X	X	X		X
Canada	✓	X	X	X				
China	X			X				
Croatia	X			X				
New Zealand	X	X	X	✓				

We can now see that Silvia must be from Croatia and Martha must be from Canada. Therefore, Christina must be from China. Also, since the Canadian finished first, Martha must have finished first. The table is updated with the corresponding ✓’s and X’s. This table is shown at the top of the next page.





	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	Canada	China	Croatia	New Zealand
Christina	X			X	X	✓	X	X
Martha	✓	X	X	X	✓	X	X	X
Natalie	X	X	X	✓	X	X	X	✓
Silvia	X			X	X	X	✓	X
Canada	✓	X	X	X				
China	X			X				
Croatia	X			X				
New Zealand	X	X	X	✓				

We have now gone through all of the clues and it may appear as though we are stuck here. We need to analyze further and go back over the given information. In particular, let's go back to clue (4). We are told that Silvia finished ahead of the competitor from China. We now know that Christina is the competitor from China. Therefore, Silvia finished ahead of Christina. So Silvia must have finished second and Christina finished third. This means that the athlete from Croatia finished second and the athlete from China finished third. The table is updated below.

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	Canada	China	Croatia	New Zealand
Christina	X	X	✓	X	X	✓	X	X
Martha	✓	X	X	X	✓	X	X	X
Natalie	X	X	X	✓	X	X	X	✓
Silvia	X	✓	X	X	X	X	✓	X
Canada	✓	X	X	X				
China	X	X	✓	X				
Croatia	X	✓	X	X				
New Zealand	X	X	X	✓				

In conclusion,

Martha, the athlete from Canada, finished in first place,  
 Silvia, the athlete from Croatia, finished in second place,  
 Christina, the athlete from China, finished in third place, and  
 Natalie, the athlete from New Zealand, finished in fourth place.

