



Problem of the Week

Problem E and Solution

Multiple Podiums?

Problem

Anita, Carly, and Liz are downhill skiers who competed in the Winter Olympics.

Anita, Carly and Liz each finished in first, second or third in the downhill skiing event. There were no ties. Anita, Carly and Liz are also from different countries. One is from Canada, one is from Denmark and one is from Belgium. Each athlete also participates in a second event. One participates in the biathlon, one participates in ski jumping and one participates in cross-country skiing.

Using the following clues, determine who placed first, second and third in downhill skiing, which country each athlete is from, and the second event each athlete participates in.

1. The Canadian athlete, the person who came in third place, and the ski jumper are three different people.
2. The Belgian was faster in downhill skiing than Liz.
3. The cross-country skier did not come in third place in the downhill skiing event.
4. Carly came in second place in downhill skiing and she is not a ski jumper.
5. Anita was faster in downhill skiing than the athlete who also competes in the biathlon.

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 the Canadian did not come in third place, the ski jumper did not come in third place, and that the ski jumper is not Canadian. We can put an X in the corresponding cells. The table is updated below.

	First	Second	Third	Canada	Denmark	Belgium	Biathlon	Ski Jump	Cross-Country
Anita									
Carly									
Liz									
Biathlon									
Ski Jump			X	X					
Cross-Country									
Canada			X						
Denmark									
Belgium									





From clue (2), since the Belgian was faster than Liz, the Belgian did not come in third place and Liz did not come in first place in downhill skiing. Also, Liz cannot be the Belgian. We can put an X in the corresponding cells. The table is updated below.

	First	Second	Third	Canada	Denmark	Belgium	Biathlon	Ski Jump	Cross-Country
Anita									
Carly									
Liz	X					X			
Biathlon									
Ski Jump			X	X					
Cross-Country									
Canada			X						
Denmark									
Belgium			X						

We see that the athlete from Denmark must have finished third. We can add a ✓ to the corresponding cell in the table. Since the Danish athlete finished third, she did not finish first or second, so we can add X's to the corresponding cells in the table. The table is updated below.

	First	Second	Third	Canada	Denmark	Belgium	Biathlon	Ski Jump	Cross-Country
Anita									
Carly									
Liz	X					X			
Biathlon									
Ski Jump			X	X					
Cross-Country									
Canada			X						
Denmark	X	X	✓						
Belgium			X						

In clue (3), we are given that the cross-country skier did not come in third place. We can put an X in the cell corresponding to cross-country and third place. Also, since we know the Danish skier came in third, we can also put an X in the cell corresponding to Denmark and cross-country. The table is updated below.

	First	Second	Third	Canada	Denmark	Belgium	Biathlon	Ski Jump	Cross-Country
Anita									
Carly									
Liz	X					X			
Biathlon									
Ski Jump			X	X					
Cross-Country			X		X				
Canada			X						
Denmark	X	X	✓						
Belgium			X						





We see that the athlete who also participates in the biathlon must have come in third place in the downhill skiing event. We can add a ✓ to the corresponding cell in the table. Since the athlete who participated in the biathlon finished third, she did not finish first or second, so we can add X's to the corresponding cells in the table. The table is updated below.

	First	Second	Third	Canada	Denmark	Belgium	Biathlon	Ski Jump	Cross-Country
Anita									
Carly									
Liz	X					X			
Biathlon	X	X	✓						
Ski Jump			X	X					
Cross-Country			X		X				
Canada			X						
Denmark	X	X	✓						
Belgium			X						

In clue (4), we are told that Carly came in second place in downhill skiing. We can put a ✓ in the corresponding cell. This also tells us that Carly did not come in first place or third place, that Anita did not come in second place, and that Liz did not come in second place. We can add X's in the corresponding cells. We are also given that Carly is not a ski jumper, so we put an X in the corresponding cell. The table is updated below.

	First	Second	Third	Canada	Denmark	Belgium	Biathlon	Ski Jump	Cross-Country
Anita		X							
Carly	X	✓	X					X	
Liz	X	X				X			
Biathlon	X	X	✓						
Ski Jump			X	X					
Cross-Country			X		X				
Canada			X						
Denmark	X	X	✓						
Belgium			X						

We can now see that Liz must have come in third place and Anita came in first. Since Liz came in third place and we already know that the third place athlete is Danish and also competes in the biathlon, Liz must be Danish and compete in the biathlon. We update the row corresponding to Liz and the columns corresponding to Denmark and biathlon.

	First	Second	Third	Canada	Denmark	Belgium	Biathlon	Ski Jump	Cross-Country
Anita	✓	X	X		X		X		
Carly	X	✓	X		X		X	X	
Liz	X	X	✓	X	✓	X	✓	X	X
Biathlon	X	X	✓		✓				
Ski Jump			X	X	X				
Cross-Country			X		X				
Canada			X						
Denmark	X	X	✓						
Belgium			X						





From the column corresponding to ski jump, we can now see that Anita must be the ski jumper. From the row corresponding to ski jump, we can now see that the ski jumper must be Belgian. Therefore, Anita, must also be the Belgian. Also, since Anita finished in first place, the Belgian ski jumper must have also finished in first. The table is updated below to reflect this new information.

	First	Second	Third	Canada	Denmark	Belgium	Biathlon	Ski Jump	Cross-Country
Anita	✓	X	X	X	X	✓	X	✓	X
Carly	X	✓	X		X	X	X	X	
Liz	X	X	✓	X	✓	X	✓	X	X
Biathlon	X	X	✓		✓	X			
Ski Jump	✓	X	X	X	X	✓			
Cross-Country	X		X		X	X			
Canada	X		X						
Denmark	X	X	✓						
Belgium	✓	X	X						

It is now clear that Carly must be the Canadian, she finished in second and also competes in cross-country skiing. We can updated the table again to reflect this new information.

	First	Second	Third	Canada	Denmark	Belgium	Biathlon	Ski Jump	Cross-Country
Anita	✓	X	X	X	X	✓	X	✓	X
Carly	X	✓	X	✓	X	X	X	X	✓
Liz	X	X	✓	X	✓	X	✓	X	X
Biathlon	X	X	✓	X	✓	X			
Ski Jump	✓	X	X	X	X	✓			
Cross-Country	X	✓	X	✓	X	X			
Canada	X	✓	X						
Denmark	X	X	✓						
Belgium	✓	X	X						

In conclusion,

- Anita came in first in downhill skiing. She competes for Belgium and also participates in the ski jump.
- Carly came in second in downhill skiing. She competes for Canada and also participates in cross-country skiing.
- Liz came in third in downhill skiing. She competes for Denmark and also participates in the biathlon.

Notice that we could have used clue (5) to help solve the problem, but we didn't actually need it. We can verify that our solution satisfies clue (5). Was Anita faster than the athlete who competes in the biathlon? Liz also competes in the biathlon, and she came in third in downhill skiing. Anita came in first in downhill skiing. Therefore, our answer also satisfies clue (5).

The solution presented above shows one of many ways of processing the clues. Part of the key to solving this type of problem is to use a clue for what it tells you both directly and indirectly.

