



Problem of the Week

Problem D and Solution

All in the Family

Problem

Five brother-sister pairs are participating at the Winter Olympics. Each pair is involved in the events in the same sport. No two pairs are in the same sport. Using the following clues, determine each brother-sister pair and their sport.

1. Grace's brother is Caleb.
2. Jess participates in Slalom and her brother is not Daniel.
3. Isabelle is not a participant in Luge at the Olympics.
4. Ezra and his sister Helga are participating in Moguls.
5. Anton, in the Biathlon, is not Isabelle's brother.

Solution

Using the ordered triplets (sister, brother, sport) the solution is; (Frieda, Anton, Biathlon), (Grace, Caleb, Luge), (Helga, Ezra, Moguls), (Isabelle, Daniel, Curling) and (Jess, Brian, Slalom). A possible solution is shown below.

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 told Grace and Caleb are brother and sister. We will put a ✓ in the corresponding cell. We then put X's in the cells corresponding to Frieda, Helga, Isabelle and Jess being Caleb's sister and in the cells corresponding to Anton, Brian, Daniel and Ezra being Grace's brother.

In clue (2), we are told Jess participates in Slalom. We will put a ✓ in the cell corresponding to Jess and Slalom. We then put X's in the cells corresponding to Jess participating in Biathlon, Curling, Luge or Moguls and for each cell corresponding to Frieda, Grace, Helga or Isabelle participating in Slalom. Also Jess is not Daniel's brother. So we will put an X in corresponding cell. Since Jess does Slalom and Daniel is not her brother, therefore Daniel cannot participate in Slalom. So we will put an X in the corresponding cell. These are shown on the chart below.

	Frieda	Grace	Helga	Isabelle	Jess	Biathlon	Curling	Luge	Moguls	Slalom
Anton		X								
Brian		X								
Caleb	X	✓	X	X	X					
Daniel		X			X					X
Ezra		X								
Biathlon					X					
Curling					X					
Luge					X					
Moguls					X					
Slalom	X	X	X	X	✓					





In clue (3), Isabelle does not participate in Luge, we put an X in the corresponding cell. In clue (4) we are told Ezra and Helga are brother and sister. We will put a ✓ in the corresponding cell. We then put X's in the cells corresponding to Frieda, Isabelle or Jess being Ezra's sister and in the cells corresponding to Anton, Brian, or Daniel being Helga's brother. We are also told Ezra participates in Moguls. We will put a ✓ in the corresponding cell. We then put X's in the cells corresponding to Ezra participating in Biathlon, Curling, Luge or Slalom and in the cells corresponding to Anton, Brian, Caleb or Daniel participating in Moguls. We are also told Helga participates in Moguls. We will put a ✓ in the corresponding cell. We then put X's in the cells corresponding to Helga participating in Biathlon, Curling, or Luge and in the cells corresponding to Frieda, Grace or Isabelle participating in Moguls. The updated chart is shown below.

	Frieda	Grace	Helga	Isabelle	Jess	Biathlon	Curling	Luge	Moguls	Slalom
Anton		X	X						X	
Brian		X	X						X	
Caleb	X	✓	X	X	X				X	
Daniel		X	X		X				X	X
Ezra	X	X	✓	X	X	X	X	X	✓	X
Biathlon			X		X					
Curling			X		X					
Luge			X	X	X					
Moguls	X	X	✓	X	X					
Slalom	X	X	X	X	✓					

In clue (5), we are told Anton participates in Biathlon. We will put a ✓ in the corresponding cell. We then put X's in the cells corresponding to Anton participating in Curling, Luge or Slalom and in the cells corresponding to Brian, Caleb or Daniel participating in Biathlon. We are also told that Anton is not Isabelle's brother. We will put an X in the corresponding cell. Also since Anton does Biathlon and is not Isabelle's brother, then Isabelle does not do biathlon and we will put an X the corresponding cell. The updated chart is shown below.

	Frieda	Grace	Helga	Isabelle	Jess	Biathlon	Curling	Luge	Moguls	Slalom
Anton		X	X	X		✓	X	X	X	X
Brian		X	X			X			X	
Caleb	X	✓	X	X	X	X			X	
Daniel		X	X		X	X			X	X
Ezra	X	X	✓	X	X	X	X	X	✓	X
Biathlon			X	X	X					
Curling			X		X					
Luge			X	X	X					
Moguls	X	X	✓	X	X					
Slalom	X	X	X	X	✓					





Now if you look at Isabelle’s column you will notice that Curling is the only sports option left for Isabelle. We will put a ✓ in the corresponding cell and put X’s in the cells corresponding to Frieda or Grace participating in Curling. Also notice that Anton is in Biathlon and Jess is in Slalom so they are not brother and sister. So we will put an X in the corresponding cell. The updated chart is shown below.

	Frieda	Grace	Helga	Isabelle	Jess	Biathlon	Curling	Luge	Moguls	Slalom
Anton		X	X	X	X	✓	X	X	X	X
Brian		X	X			X			X	
Caleb	X	✓	X	X	X	X			X	
Daniel		X	X		X	X			X	X
Ezra	X	X	✓	X	X	X	X	X	✓	X
Biathlon			X	X	X					
Curling	X	X	X	✓	X					
Luge			X	X	X					
Moguls	X	X	✓	X	X					
Slalom	X	X	X	X	✓					

Now, if you look at Anton’s row, you will notice that Frieda is the only sister option for Anton. We will put a ✓ in the corresponding cell and put X’s in the cells corresponding to Frieda being sister to Brian or Daniel. If you look at Jess’s column you will notice that Brian is the only brother option for Jess. We will put a ✓ in the corresponding cell and put an X in the cell corresponding to Isabelle being a sister to Brian. The updated chart is shown below.

	Frieda	Grace	Helga	Isabelle	Jess	Biathlon	Curling	Luge	Moguls	Slalom
Anton	✓	X	X	X	X	✓	X	X	X	X
Brian	X	X	X	X	✓	X			X	
Caleb	X	✓	X	X	X	X			X	
Daniel	X	X	X		X	X			X	X
Ezra	X	X	✓	X	X	X	X	X	✓	X
Biathlon			X	X	X					
Curling	X	X	X	✓	X					
Luge			X	X	X					
Moguls	X	X	✓	X	X					
Slalom	X	X	X	X	✓					





Now, if you look at Daniel's row, you will notice that Isabelle is the only sister option for Daniel. We will put a ✓ in the corresponding cell. Now Anton participates in Biathlon and Anton is Frieda's brother, therefore Frieda also participates in Biathlon. We will put a ✓ in the corresponding cell and put an X in the cell corresponding to Grace corresponding to Biathlon and in the cell corresponding to Frieda participating in Luge. Also Jess is Brian's sister and Jess in the Slalom, therefore Brian is in the Slalom. We will put a ✓ in the corresponding cell and put an X in the cell corresponding to Caleb participating in Slalom and X's in the cells corresponding to Brian participating in Curling or luge. The updated chart is shown below.

	Frieda	Grace	Helga	Isabelle	Jess	Biathlon	Curling	Luge	Moguls	Slalom
Anton	✓	X	X	X	X	✓	X	X	X	X
Brian	X	X	X	X	✓	X	X	X	X	✓
Caleb	X	✓	X	X	X	X			X	X
Daniel	X	X	X	✓	X	X			X	X
Ezra	X	X	✓	X	X	X	X	X	✓	X
Biathlon	✓	X	X	X	X					
Curling	X	X	X	✓	X					
Luge	X		X	X	X					
Moguls	X	X	✓	X	X					
Slalom	X	X	X	X	✓					

Finally, if you look at Grace's column, Luge is the only option for a sport. So we will put a ✓ in the corresponding cell. Since Grace is in Luge and Caleb is her brother then Caleb is in luge, therefore we will put a ✓ in the corresponding cell. Also note that Isabelle is in Curling and Daniel is her brother, therefore Daniel is in Curling. We will put a ✓ in the corresponding cell. We now put X's in the cell corresponding to Caleb participating in Curling and in the cell corresponding to Daniel participating in Luge. The final updated chart is shown below.

	Frieda	Grace	Helga	Isabelle	Jess	Biathlon	Curling	Luge	Moguls	Slalom
Anton	✓	X	X	X	X	✓	X	X	X	X
Brian	X	X	X	X	✓	X	X	X	X	✓
Caleb	X	✓	X	X	X	X	X	✓	X	X
Daniel	X	X	X	✓	X	X	✓	X	X	X
Ezra	X	X	✓	X	X	X	X	X	✓	X
Biathlon	✓	X	X	X	X					
Curling	X	X	X	✓	X					
Luge	X	✓	X	X	X					
Moguls	X	X	✓	X	X					
Slalom	X	X	X	X	✓					

