

Exercise 4.42.

Solve the following “Liars” puzzle (from Phillips 1934):

Five schoolgirls sat for an examination. Their parents—so they thought—showed an undue degree of interest in the result. They therefore agreed that, in writing home about the examination, each girl should make one true statement and one untrue one. The following are the relevant passages from their letters:

- Betty: “Kitty was second in the examination. I was only third.”
- Ethel: “You’ll be glad to hear that I was on top. Joan was second”
- Joan: “I was third, and poor old Ethel was bottom.”
- Kitty: “I came out second. Mary was only fourth.”
- Mary: “I was fourth. Top place was taken by Betty.”

What in fact was the order in which the five girls were placed?


Answer.

All these 5 girls can be divided into two groups: Group I (Ethel and Joan) and Group II (Betty, Kitty and Mary), for their statements merely involves members in the same group. Observe that Ethel and Joan are only able to take up the top, the second, the third and the bottom position. Thus, the fourth one falls into Group II, to which Mary is closely related.

Suppose that Mary was the fourth one, then neither Betty is on the top nor Kitty the second. In terms of Betty, she is placed to the third position, thereby indicating that Joan’s first statement is false, and Ethel did sit on the bottom. At this point, by Ethel whose first statement proved to be a fake, Joan was second. So the top position belongs to Kitty. This deduction is legitimate, since no contradiction arouse in the process.

On the other hand, if Mary was no the fourth one, then Betty would be on top and Kitty came out second. This indicates that none of Ethel’s statements holds, which againsts the assertion that each girl should make one true statement and one untrue one. Hence, this assumption can not stands, which reinforces our original deduction on the opposite side.

Now we can draw a conclusion that the five girls were placed in the order: Kitty is on top, Joan the second, Betty the third, Mary the fourth and Ethel the last one.

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