Brian Barbu (brb9da)

Portfolio Problem 1A

Is it possible to determine who is chatting if the following information is known?

1.) Kevin, Heather, or both, are chatting

2.) Either Randy or Vijay, but not both, are chatting

3.) If Abby is chatting, so is Randy

4.) Vijay and Kevin are either both chatting or neither is

5.) If Heather is chatting, then so are Abby and Kevin

Symbolic Logic Equivalent:

1.) $K \lor H$

2.) $R \oplus V \equiv (R \lor V) \land \neg(R \land V)$

3.) $A \rightarrow R$

4.) $(V \land K) \oplus \neg(V \land K)$

5.) $H \rightarrow (A \land K)$

Explanation of problem:

From statement 1, three logical tracks can be derived for this problem. One track is where Heather is chatting and Kevin is not, the second is where Kevin is chatting and Heather is not, and the last is where both Heather and Kevin are chatting. The first track can be eliminated, since statement 5 says that if heather is chatting, then Abby and Kevin must be chatting. This contradicts the logical track proposed where Heather is chatting and Kevin is not. This track therefore fails logically and is not a possibility.

In the second track where Kevin is chatting and Heather is not, Vijay must also be chatting by statement 4. Since Vijay is chatting, by statement 2 we know that Randy must not be chatting. The only conclusion we have not been able to uncover is whether Abby is chatting. By statement 3 if Abby was chatting, Randy must also be chatting. However, we know that Randy is not chatting, so therefore Abby cannot be chatting otherwise Randy would have to be chatting.

In the last track, Heather and Kevin are both chatting. By statement 5, since Heather is chatting then Abby and Kevin are also chatting. Since Abby is chatting, by statement 3 Randy is also chatting. Kevin is already chatting, so by statement 4 Vijay would also be chatting. An error arises for this logical track in statement 2 which states that either Randy or Vijay, but not both are chatting. In this logical track where Heather and Kevin are both chatting, Randy and Vijay would both be chatting which does not pass the preposition shown in statement 2. Therefore, Heather and Kevin cannot both be chatting in this problem.

Since the first logical track where Heather is chatting and Kevin is not and the last track where both Heather and Kevin are both chatting failed logically by the statements proposed, the second logical track must be the correct method.

It can be concluded that Kevin and Vijay are chatting while Heather, Abby, and Randy are not chatting.

Comments by Ansley Gould (awg5ps):

Well done! Your logic for the three different tracks seems well thought out and your conclusion to be correct. The first thing I would do in order to make your arguments more clear would be to declare or define your variables (e.g. “Let K represent Kevin is chatting”). Although I could assume what each variable went with, you still need to define them to make it perfectly clear exactly what each variable means. Another suggestion I would give is to put the symbolic logic into your arguments, possibly in the form of a proof. This will make it easier to connect the statements from argument to argument.

Here is a way you could show your logic using proofs:

Let us assume first that Heather and Kevin are both chatting:

1.	$K \vee H$	
2.	$R \oplus V \equiv (R \vee V) \wedge \neg(R \wedge V)$	
3.	$A \rightarrow R$	
4.	$(V \wedge K) \oplus \neg(V \wedge K)$	
5.	$H \rightarrow (A \wedge K)$	
6.	H	Assumed
7.	K	Assumed
8.	$A \wedge K$	Modus Ponens (6, 5)
9.	A	Simplification (8)
10.	R	Modus Ponens (9, 3)

This is where this track does not work. If we know that Randy is chatting, then by statement 2, Vijay can not be chatting, however; we also know that Kevin is chatting and, according to statement 4, if Kevin is chatting, Vijay must also be chatting. This proves a contradiction between these two and therefore this assumption does not work.

Let us assume now that Heather is chatting and Kevin is not:

1.	$K \vee H$	
2.	$R \oplus V \equiv (R \vee V) \wedge \neg(R \wedge V)$	
3.	$A \rightarrow R$	
4.	$(V \wedge K) \oplus \neg(V \wedge K)$	
5.	$H \rightarrow (A \wedge K)$	
6.	H	Assumed
7.	$\neg K$	Assumed

There is nowhere to go with this track, because statement 5 will be false.

Let us assume now that Kevin is chatting and Heather is not:

1.	K V H	
2.	R ⊕ V ≡ (R v V) ^ ¬(R ^ V)	
3.	A → R	
4.	(V ^ K) ⊕ ¬(V ^ K)	
5.	H → (A ^ K)	
6.	K	Assumed
7.	¬H	Assumed
8.	V ^ K	Law of Excluded Or (6, 4)
9.	V	Simplification
10.	¬R	Law of Excluded Or (2, 9)
11.	¬A	Modus Tollens (10, 3)

With this assumption, we have proven whether or not each person is chatting. We can conclude that Vijay and Kevin are both chatting and Heather, Abby, and Randy are not.

Portfolio Problem 1C
Ansley Gould (awg5ps)

Problem 1C: The police have three suspects for the murder of Mr. Cooper: Mr. Smith, Mr. Jones, and Mr. Williams. Smith, Jones and Williams each declare that they did not kill Cooper. Smith also states that Cooper was a friend of Jones and that Williams disliked him. Jones also states that he did not know Cooper and that he was out of town the day Cooper was killed. Williams also states that he saw both Smith and Jones with Cooper the day of the killing and that either Smith or Jones must have killed him. Can you determine who the murderer was if one of the three men is guilty, they two innocent men are telling the truth, but the statement of the guilty man may or may not be true?

Facts Stated:

1. All declare they did not kill Mr. Cooper.
2. Mr. Smith says that Mr. Cooper was friends with Mr. Jones and Mr. Williams did not like him.
3. Mr. Jones states he did not know Mr. Cooper and was out of town on the day of the killing.
4. Mr. Williams says he saw Mr. Smith and Mr. Jones with Mr. Cooper on the day of the killing and Mr. Smith or Mr. Jones must have killed him.

Parameters:

1. One of the three men is guilty.
2. The two innocent men are telling the truth.
3. Statement of the guilty may or may not be true.

Assume that Smith and Jones are innocent and telling the truth.

- Truths:
    - Mr. Cooper was friends with Mr. Jones
    - Mr. Williams did not like Mr. Cooper
    - Mr. Jones does not know Mr. Cooper and was out of town.
- Possible:
    - Mr. Williams saw Mr. Smith and Mr. Jones with Mr. Cooper
- This means that:
    - Mr. Smith and Mr. Jones cannot be the two innocent men, because if both innocent men are definitely telling the truth, Mr. Jones and Mr. Smith's statements contradict each other. Mr. Smith says that Mr. Jones was friends with Mr. Cooper, but J says that he did not know Mr. Cooper.

Assume that Jones and Williams are innocent and telling the truth.

- Truths:
    - Mr. Jones does not know Mr. Cooper and was out of town.
    - Mr. Williams saw Mr. Smith and Mr. Jones with Mr. Cooper
- Possible:
    - Mr. Cooper was friends with Mr. Jones
    - Mr. Williams did not like Mr. Cooper

- This means that:
  - Mr. Williams and Mr. Jones cannot be the two innocent men, because if both innocent men are definitely telling the truth, Mr. Jones and Mr. Smith's statements contradict each other. Mr. Jones says that he was out of town, but Mr. Williams says that he saw Mr. Jones with Mr. Cooper, meaning he was not out of town.

Assume that Williams and Smith are innocent and telling the truth.

- Truths:
  - Mr. Cooper was friends with Mr. Jones
  - Mr. Williams did not like Mr. Cooper
  - Mr. Williams saw Mr. Smith and Mr. Jones with Mr. Cooper
- Possible:
  - Mr. Jones does not know Mr. Cooper and was out of town
- This means that:
  - This conclusion makes the most sense, because none of the absolute truths contradict each other. Although Mr. Jones says that he does not know Mr. Cooper and was out of town, there is a possibility that he is lying, as he is the guilty party.

Therefore, on the basis that one of the three men is guilty and the two innocent men are telling the truth, we can determine that Mr. Jones is guilty, and Mr. Williams and Mr. Smith are innocent (and therefore telling the truth).

Comments by Brian Barbu (brb9da):

Good job coming to this answer! Your individual situational analysis is sound, but I think you could have done more in stating your final conclusion. You just say “Therefore,” without directly mentioning the major points that lead to the conclusion. I think you should be a bit more direct in describing how your parameters lead you to solve this problem. You can state that parameter 2 allows us to take the statements of two men as truth in our hypothetical approach and that parameter 3 tells us to take the third man’s statements as a possible truth. It’s important to mention that all statements can be true in the prompt, but our logical analysis shows that some are not. It would also be significant that in your conclusion you mention that if Mr. Jones’s statements were true, it would make a statement of both Mr. Williams and Mr. Smith incorrect. However, parameter 2 assures us that two people are telling the truth, so the only case that agrees with this is where Mr. Jones is guilty. Now that we have established the facts and parameters that we used, we can state our conclusion.