CSE 103:
DISCRETE MATHEMATICS

CHAPTER: 1, **SECTION**: 2

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Question #23

Exercise 23 relates to inhabitants of the island of knights and knaves created by Smullyan, where knights always tell the truth and knaves always lie. You encounter two people, *A* and *B*. Determine, if possible, what *A* and *B* are if they address you in the ways described. If you cannot determine what these two people are, can you draw any conclusions?

A says "We are both knaves" and B says nothing.

Answer: The final conclusion from the statement would be- *A is a knave, but B is a knight*.

In the context above, the knave always lies, whereas the knight always speaks the truth. So, a knave's propositions will always be **false**.

Now, here, A points out that they both are knaves. But as knaves lie, a knave cannot directly say that he is a knave, as it would be telling the truth. Also, A cannot be a knight as knights always speak the truth and a knight would never call himself a knave. So, A has to be a knave.

Now, as A is a knave, so his proposition has to be false. If both A and B are knaves, then the proposition would become true, and would lose logical construct. Specifically, if B was a knave (as we are already sure that A **is** a knave), then the proposition would break down. So, for the proposition to be false, B has to be a knight.

So, to conclude, we can with certainty say that A is a knave, whereas B is a knight.