

# Cal Poly Department of Mathematics

## Puzzle of the Week

Jan 9 - 15, 2009

The other day I over-heard the following conversation amongst mathematicians in the hallway:

Alice: "I am insane."  
Bob: "I am pure."  
Charlie: "I am applied."  
Dorothy: "I am sane."  
Alice: "Charlie is pure."  
Bob: "Dorothy is insane."  
Charlie: "Bob is applied."  
Dorothy: "Charlie is sane."

Let it be given that:

Pure mathematicians tell the truth about their beliefs.  
Applied mathematicians lie about their beliefs.  
Sane mathematicians' beliefs are correct.  
Insane mathematicians' beliefs are incorrect.

Describe the four mathematicians.

*Solutions should be submitted to Morgan Sherman:*

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*before next Friday. Those with correct and complete solutions will have their names listed in next week's email announcement. Anybody is welcome to make a submission.*

*Solution:*

Alice is applied and insane  
Bob is pure and sane  
Charlie is pure and insane  
Dorothy is pure and insane

Notice that a pure mathematician will always describe his or herself as sane (regardless of his or her actual sanity). Meanwhile an applied mathematician will always describe his or herself as insane. Therefore Alice is applied and Dorothy is pure. In a similar fashion we can reason that Charlie is insane, and Bob is sane.

Now Dorothy's statement that "Charlie is sane" is incorrect, and since we know Dorothy is pure we reason that she is also insane.

Then Bob was correct when he stated "Dorothy is insane", and since we know him to be sane he must also be pure.

Thus Charlie was incorrect when he stated "Bob is applied", and since we know Charlie to be insane he must also be pure.

Finally that means Alice was correct when she stated "Charlie is pure", and since we already know she is applied, she must also be insane.

Source: "Mathematics and Informatics" Quarterly 9:4 Dec 1999, page 162.