

Logic puzzles

20 December 2017

All problems on this sheet are from R.M. Smullyan, *What Is the Name of This Book?* The numbers in brackets refer to the problem numbers in the book.

Island of knights and knaves

An island is inhabited only by knights, who always tell the truth, and knaves, who always lie. You happen to be visiting this island and engage in conversation with the islanders, and you are curious to figure out whether you are talking to knights or to knaves.

1. (29) A says “Either I’m a knave or B is a knight”. Who’s who?
2. (33) A says “I’m a knave and B is not a knave”. Who’s who?
3. (35) There are three islanders, A, B and C. A says “B and C are of the same type”. How would C answer your question “Are A and B of the same type?”
4. (36) You meet two islanders and ask one of them “Is either of you a knight?” Your question is promptly answered and it’s enough for you to find out their types. What are they?

Alice in the Forest of Forgetfulness

Alice can’t remember the day of the week, but fortunately the Lion and the Unicorn live in the forest and they can help her. Less fortunately for Alice, the Lion lies on Mondays, Tuesdays and Wednesdays (but tells the truth the other days of the week) and the Unicorn lies on Thursdays, Fridays and Saturdays. Alice knows this.

5. (47) The Lion says “Yesterday was a day when I lie.” The Unicorn says “Yesterday was a day when I also lie.” What day of the week is it?
6. (49) On what days of the week can the Lion say “I lied Yesterday” and “I’ll lie tomorrow”?
7. (50) On what days of the week can the Lion say “I lied Yesterday and I’ll lie tomorrow”?

In Transylvania

You want to go to Transylvania to figure out whether Dracula is actually still alive. Transylvania is inhabited by people, who tell the truth, and vampires, who always lie. However half of the inhabitants are completely insane, namely they believe all true statements to be false and all false statements to be true. Hence an insane vampire will always tell the truth whereas an insane human will lie.

- 8. (167) A says “Either I am human or I am sane.” Who are they?
- 9. (168) A says “I am not a sane human.” Who are they?
- 10. (180) A says “If I am sane, then Dracula is alive”. Is this enough information to figure out whether Dracula is alive?
- 11. (187) Can you ask exactly one question to a stranger to find out whether they are human?
- 12. (188) Can you ask exactly one question to a stranger to find out whether they are sane?
- 13. (189) Can you ask exactly one question to a stranger to find out whether Dracula is alive?

You find yourself in an elite gathering of Transylvanians, where they are allowed to say “yes” and “no” only in their own language, which are “bal” and “da” but you don’t know which means which.

- 14. (192) Can you ask exactly one question to a stranger to find out whether they are sane?
- 15. (194) Can you ask a question which they are guaranteed to answer “bal”?
- 16. (195) Can you ask exactly one question to find out whether Dracula is alive?