

Math 36500: Combinatorics: Additional Homework 1

Prof. Hooper

Directions: Please answer the following questions. If you collaborate with someone, please state this. If you use sources (other than the textbook, or class notes), cite them. You must write your answer in your own words.

1. A dog shelter has four different dogs (Alphonzo, Beau, Chap, and Dodo) and four collars (in red, pink, blue and purple). How many ways can the shelter put collars on the dogs, with one collar on each dog?
2. An animal shelter has dogs and cats. Fido sniffs Fluffy. Fluffy sniffs Whiskers. Fido is a dog, and Whiskers is a cat, but we don't know if Fluffy is a dog or a cat. Is a dog sniffing a cat?
3. Suppose you are on an island where every every inhabitant is either a knight or a knave, and knights make only true statements and knaves only false ones. [This problem is from Smullyan's "To Mock a Mockingbird and Other Logic Puzzles".]
 - (a) Is it possible for any inhabitant of this island to claim that he is a knave?
 - (b) Is it possible for an inhabitant of the island to claim that he and his brother are both knaves?
 - (c) Suppose inhabitant A says about herself and her brother B : "At least one of us is a knave." What type is A and what type is B ?
 - (d) Suppose A instead says: "Exactly one of us is a knave." What can be deduced about A and what can be deduced about B ?
 - (e) Suppose A states of herself and her brother B : "My brother and I are the same type." What can be deduced about A and B ?
 - (f) Suppose A states of herself and her brother B : "My brother and I are the different types." What can be concluded?