CAS LX 522 *Syntax I*
HOMEWORK #1 **Due THURSDAY SEPTEMBER 15 (in class)**

Warmup. The "puzzler" from an October 2006 *Car Talk*. It's actually related to what we have been talking about in class, you should be able to answer it the way they did. You can find the answer on cartalk.com in the puzzler archives (so there's no need to hand in your answer to it). The idea here is that each of the four tires needs to be assigned a set of features, and what they're after is the simplest feature system to use. The way that the question is stated leads you to think of these features as privative features.

I'm going to have winter tires put on my car. I bought four of them. I'm moving soon, and since I'll be taking the car to a different shop to have them changed back next spring, the tires have to be marked so they can be put back where they belong, i.e., where they came from. So the left front has to go the left front, the right front has to go there, and so on.

When I take them off, I'm going to ask the people at the gas station to mark them with letters.

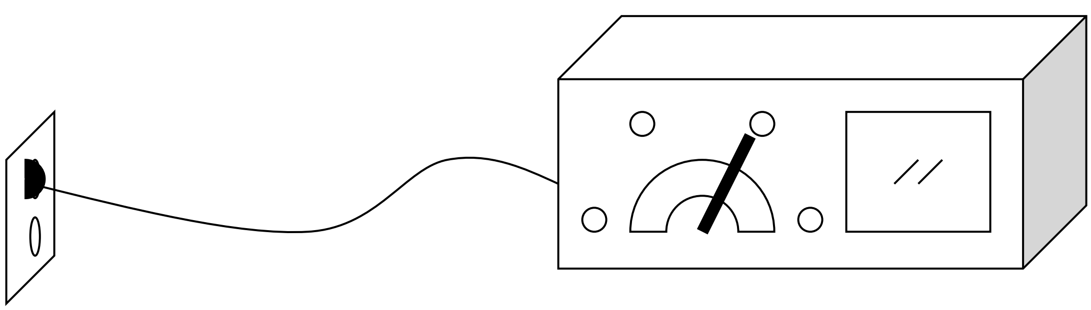
The question is, what's the smallest number of letters needed to mark my tires to guarantee that all four of them can get correctly installed with no chance of error or ambiguity in the spring?

Task 1. This is a problem, like the warmup, that is about features and how to use them to describe things. It's not about *language*, but the principles behind using features this way isn't specific to language. It can work for tires, or it can work for black boxes, like the one I'm about to describe.

Suppose that you have a box with a translucent window and a switch that can be moved around. The box is black. After some experimentation and careful observation, you determine that the colors that the box can display (depending on the switch position) are:

red **magenta (purplish)** **white** **yellow**

Below is a sketch of what this box looks like:



Side notes. The fact that the box is black is metaphorically significant (although I have not represented this in the illustration). Search Wikipedia for "black box." Here, we care primarily about the output from the black box (the color of the light—or, in part 3, the buzzing sound), not about what's going on inside, or even really about the input (what position the switch is in). It's pretty obvious what is going on inside: there are three light-emitting objects (e.g., light bulbs). One is red, one is green, and one is blue. Also not a coincidence: search Wikipedia for "rgb" if you like, and click on the "additive color model" link if you aren't convinced that you can make yellow by combining some mix of red, green, and blue. You might also try putting something yellow on your computer screen and then examining it with a real magnifying glass (or put your eyeball right up to the screen): that yellow is actually made of a very small green dot and a very small red dot, very close together. Maybe a blue dot too unless you picked a very pure and saturated yellow object to examine.

Part 1. Below is a non-optimal model characterizing the output from our light box. It describes binary features that the box can take on, and for each of the four output states, demonstrates what the feature specification is that corresponds to that state. But this is not a good model of the output of this system.

Features:	[±R], [±B], [±G]
red:	[+R, –B, –G]
magenta:	[+R, +B, –G]
white:	[+R, +B, +G]
yellow:	[+R, –B, +G]

Question 1: Does this model overgenerate or undergenerate?
Question 2: What does it predict that is not attested? (*Hint*: One of the predictions is that the box should be able to show cyan, a blue-green color—what are the others?)

Part 2. Construct a better theoretical model of this box, by proposing a **binary feature** system to describe and predict the states this box can take on (in this way, not different from the non-optimal model in part 1, which was also a binary feature system). To do this, name the binary features you need (and note that the actual names you use doesn't really matter, though you could use things like R, G, or B), and indicate the features of each of the four observed states. Give these in the same format as the model from part 1.

Part 3. Suppose that we observe that this box makes a disconcerting buzzing noise when the color it displays is red or magenta (but not when the color is white or yellow). Describe the situation in which the buzzing noise happens, in terms of your theoretical model (from part 2). (That is, what features correspond to the buzzing noise? Try not to use the word "or" in your description.)

Part 4. Construct an alternative model of the box using privative features instead. (Like Part 2, except with privative features.)

Part 5. The difference between privative features and binary features is that a binary feature can have a – value, whereas a privative feature is either there or absent. If we suppose that in a model of the buzzing situation in Part 3, only features that are there can be referred to in the conditions, is one of the two models from Part 2 and Part 4 better at describing the buzzing situation in Part 3—and why (or why not)? (*Note*: this depends a little bit on your other answers, so you might find that they're equally good models for describing the buzzing, or you might find one better than the other.)

If you found that your model in part 4 was not as good at describing the descriptive generalization about the buzzing, what changes might you make either to the descriptive generalization in Part 3 or the features in Part 4 to make a model with privative features better able to capture the generalization?

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Task 2. Here's something more straightforward. Assign a category (N, V, A, P, C, T, D) to each word below:

(1) Pat will take a gigantic step across the yellow line.

(2) Tracy should embrace creativity.

(3) Chris heard that Robin broke the ancient record.

(4) The yinkish dripner blorked into the nindin.