

Philosophy 12, Problem Set 6

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1 Q1

1.1 a

Randomly pick items into the bag until we overshoot the maximum weight W . Then remove the last item and check if what's in the bag has at least V calories. If it does, we have shown that S exists. If not we take every item out and repeat the algorithm.

This is not a polynomial time algorithm. Since we are randomly selecting the items, it is possible to never find such a set S even if S exists.

1.2 b

Since each item can either be picked or not picked, there are 2^n ways to pick our items for the backpack. Now we can simply iterate through all 2^n options to see if any fits the requirement of having less weight than W and more calories than V .

This is also not a polynomial time algorithm since 2^n is exponential.

2 Q2

2.1 Each country has at least one color

Let i be an arbitrary country, then we have $c_i \vee m_i \vee y_i$. Therefore we can apply to all i :

$$\bigwedge_{i=1}^n (c_i \vee m_i \vee y_i)$$

2.2 Each country has at most one color

Let i be an arbitrary country, then we have $(c_i \wedge \neg m_i \wedge \neg y_i) \vee (m_i \wedge \neg y_i \wedge \neg c_i) \vee (y_i \wedge \neg c_i \wedge \neg m_i)$. Therefore we can apply to all i :

$$\bigwedge_{i=1}^n (c_i \wedge \neg m_i \wedge \neg y_i) \vee (m_i \wedge \neg y_i \wedge \neg c_i) \vee (y_i \wedge \neg c_i \wedge \neg m_i)$$

2.3 No adjacent countries have the same color

If two adjacent countries have the same color then $(c_i \wedge c_j) \vee (m_i \wedge m_j) \vee (y_i \wedge y_j)$
We can negate that for all such i, j

$$\begin{aligned} & \neg \bigvee_{i,j \text{ adjacent}} (c_i \wedge c_j) \vee (m_i \wedge m_j) \vee (y_i \wedge y_j) \\ & \equiv \bigwedge_{i,j \text{ adjacent}} \neg(c_i \wedge c_j) \wedge \neg(m_i \wedge m_j) \wedge \neg(y_i \wedge y_j) \end{aligned}$$

Finally we can simply combine these, so our answer is $(2.1) \wedge (2.2) \wedge (2.3)$

3 Q5

The first statement is true because there are only two Republicans in the race: Reagan and Anderson. The second statement is where the problem begins. “A Republican” will win the election is true in the pollee’s mind because Regan is a Republican. They have subsituted “a republican” with “Reagan” because he is decisively ahead of Carter. Therefore the final conclusion: “If it’s not Regan who wins, it will be Anderson” doesn’t make sense.

This shows that everyday English is not as strict as formal logic and contains a lot of implicit substitutions of terms.