CS 6301.503 Spring 2019 Scott C. Waggener (scw180000)
Homework 4 (Probability) Problem 1

(a) You're person B and want to win, which version of the game do you play?

Solution: The standard version ■

Proof: First a qualitative answer: In the standard version of the game answers are received immediately after each question, meaning that the answer to question $q-1$ will inform what should be asked for question q. Expressed mathematically, the conditional probability of possible objects at iteration i will be of the form

$$P(O = o_n) = P\left(o_n \middle| a_{i-1}, a_{i-2}, \dots a_1\right) \tag{1}$$

where a_i is the answer to the ith question. If person B wants to maximize $P(O = o_n)$ for some object, they need □

CS 6301.503 Spring 2019 Scott C. Waggener (scw180000)

Homework 4 (Probability) Problem 5

Assume ImageNet has 1.28 million images of size 3 x 256 x 256 with 1280 images each in 1000 different classes. How many bits of information are in the ImageNet labels?

Solution: 28 bits ■

Proof: Let I_c denote the number

$$I_c = 3 * 256 * 256 * 1280 \tag{2}$$
$$= 251658240 \tag{3}$$

$$B = \left\lceil \lg(I_c) \right\rceil = \left\lceil \lg(251658240) \right\rceil \tag{4}$$
$$B = 28 \tag{5}$$

□