

1. Give an example of background assumptions X , a hypothesis H , and data proposition D such that $P[D|HX]$ is very small but that fact would not convince you to doubt H . Why not?
2. Consider the candy-sampling example with $H_1 =$ "Our bag of candy came from the high-green factory under normal conditions." (so $P[G_i|H_1X] = \frac{1}{3}$) and $H_2 =$ "Our bag of candy came from another factory under normal conditions." (so $P[G_i|H_2X] = \frac{1}{6}$). Suppose your background assumptions X allow a third possibility, $H_3 =$ "The manufacturer has stopped producing green candy." and assume you assign prior probabilities $P[H_3|X] = \frac{1}{1000}$, $P[H_1|\overline{H_3}X] = \frac{1}{11}$, and $P[H_2|\overline{H_3}X] = \frac{10}{11}$. You open a bag and out of the first n candies you see none are green. Given this information, for what value of n would you assign greater probability to H_3 than H_2 ?
3. Suppose you and a friend play the following game: Your friend rolls a fair 6-sided die and records the outcome secretly; call this number the "secret number." You then roll the same die but are not able to see the outcome. Instead, your friend (who can see the results) tells you only whether your roll is higher (H) than the secret number, lower (L) than it, or a match (M). After 10 such rolls you win if you can guess what the secret number was. Assume the results of your 10 rolls were "LLHLLMLLLH." What number would you guess, and what would you say is your probability of being correct?
4. Suppose a student of probability asks you the following question: "I understand how we can talk about the probability of data given a hypothesis, since the data can be different each time you collect it. But how can we talk about the probability of the hypothesis? Isn't a hypothesis just either true or false?" How would you answer this question? Give an example to illustrate your point.

PROBA