

Why probability?

- better forecasting (i.e. never go to casinos)
- inference about important but hard-to-observe variables using noisy but observable variables (i.e. medical tests)

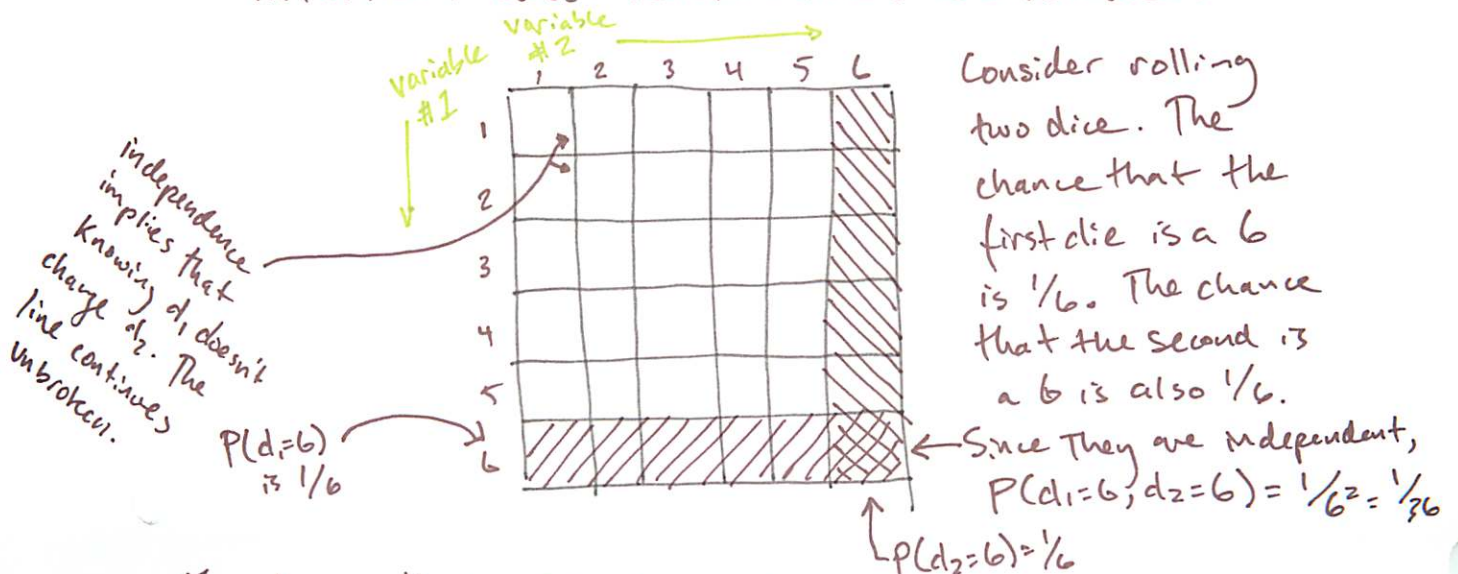
< ruling out boring explanations

(Gimli: "Nothing, it's just a whiff of cloud"
 Boromir: "It's moving fast... against the wind!")

Problem: events that seem rare are actually sometimes quite likely, like flipping tails seven times in a row.

Goals: estimate probability of events from data,
 estimate probability of complicated events from combinations of simple events.

I like to visualize two-variable probability distributions using proportionally sized rectangles, since my intuitions about relative areas are reliable.



The chance that at least one die is a six is the area of the \sqcup region $P(d_1=6) + P(d_2=6) - P(d_1=6, d_2=6) = 11/36$
 - or - $1.0 - P(d_1 \neq 6) \cdot P(d_2 \neq 6) = 1 - \frac{5}{6} \cdot \frac{5}{6} = 11/36 !!$