$$\underbrace{g(q) := 2q - q^2}$$

inclusion-exclusion
independent & (equally likely)

$$P := \Pr[B \cap b \mid B^{o} \cup b^{o}]$$

$$\boxed{\Pr[(B \cap b) \cap (B^{T} \cup b^{T})] =}$$

$$\Pr[B \cap b] \cdot \Pr[B^{T} \cup b^{T} \mid B \cap b] = \cancel{\tfrac{1}{4}}\, \frac{1}{2} \cdot \frac{1}{2} \cdot g\left(\frac{1}{7}\right)$$

$$= \frac{1}{4} \cdot \left(\frac{2}{7} - \frac{1}{49}\right)$$

$$= \frac{1}{4}\left(\frac{2 \cdot 7 - 1}{7 \cdot 7}\right) = \frac{1}{4}\left(\frac{13}{49}\right)$$

$$= \frac{13}{2^2 \cdot 7^2}$$

$$\frac{13}{2^2 \cdot 7^2}$$

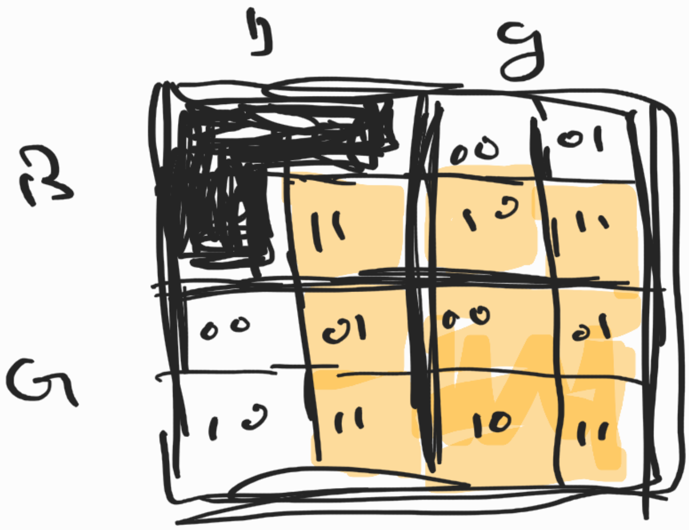
$$= \Pr[B \cap b \mid B^{T} \cup b^{T}] \cdot \Pr[B^{T} \cup b^{T}]$$

$$= P \cdot g\left(\frac{1}{2} \cdot \frac{1}{7}\right) = P \cdot \left(\frac{1}{7} - \frac{1}{2^2 \cdot 7^2}\right)$$

$$= P\left(\frac{2^2 \cdot 7 - 1}{2^2 \cdot 7^2}\right)$$

$$= P\left(\frac{28 - 1}{2^2 \cdot 7^2}\right)$$

$$13 = P(27) \Rightarrow P = \frac{13}{27}$$



→ $\frac{3}{7}$

what happened?

1st is a boy: totally eliminate squares where first is a girl

One is a boy: " " both are girls

( )" 0" : further eliminate squares where ~~if girl~~: if ~~boy~~

no girls: both on 2nd $\frac{1}{2}$

if ∃ girl: boy on 2nd $\frac{1}{2}$

($Pr = \frac{1}{2}$)

$Pr = \frac{1}{4}$ only

"more info comes closer to identifying":

Imagine playing detective, you have eliminated a full degree of freedom if you know one is a girl: you've pinned down that the boy MUST be born on first half.

~~[illegible]~~: you can totally eliminate squares where he was born in 2nd $\frac{1}{2}$.

But, if 2 boys (FIX which boy you're ~~[illegible]~~ talking about):

You can't totally rule out the square where he's a 2nd-half boy, b/c the "other" one could sneak in there. Like the game of whack-a-mole.

~~You want to~~ You are pigeonholing the girl(s) into a specific corner, but the boy(s) get the benefit of the doubt.

Asymmetric conditional probability!

Suppose 1 is a boy. Then,

if 2 is a boy, 1 can be born either day ... we'll deal w/ 2 later. Vice versa. Just can't have both 2nd-half. BUT: if 2 is a girl:

Immediately, first being 2nd-half is DOA. You "want" the girl, b/c you've ~~gotta~~ eliminated

much more possibilities. But, w/ 2 boys, you're playing whack-a-mole.

---

with Just Tues, it's even worse:

with a girl, you MUST have a Tuesday boy. But with 2 boys, you have some leeway. You can have a Tuesday boy plus a whatever (exactly like w/ girl) OR you can have a whatever boy (and then require a tuesday boy). This almost x2's the prob (except $-\frac{1}{2}^2$).

Asymmetry of first born!

~~Suppose one kid is a girl~~

Asymmetry of "either":

~~If a girl~~: There are 2x as many squares with a girl than just 2 boys.

Asymmetry of "first-born":

Actually, **NONE**: you just whack a row entirely.

But, then why should adding seemingly irrelevant info "rectify" this? **BECAUSE**:

the irrelevant info ~~kept~~ put

asymmetrical ~~implications~~ restrictions

on the event.

It is more restrictive to the "$G \cup g$" event.

(Not surprising: $G \cap g$ is gone entirely.) Now, we chip away at $G \cup g - G \cap g$, and as long as we chip away at $B \cap b$ slower, we're in business!