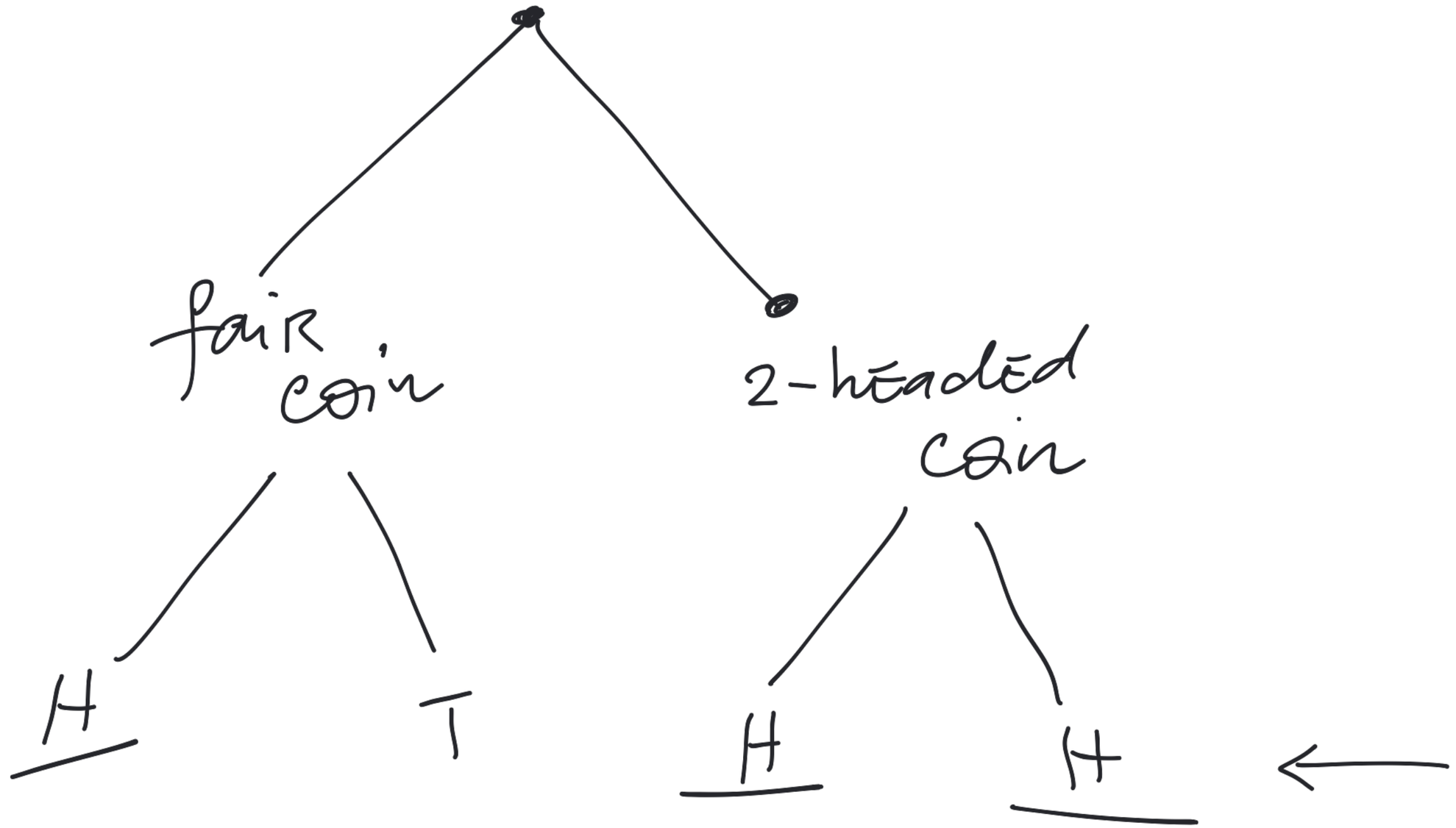
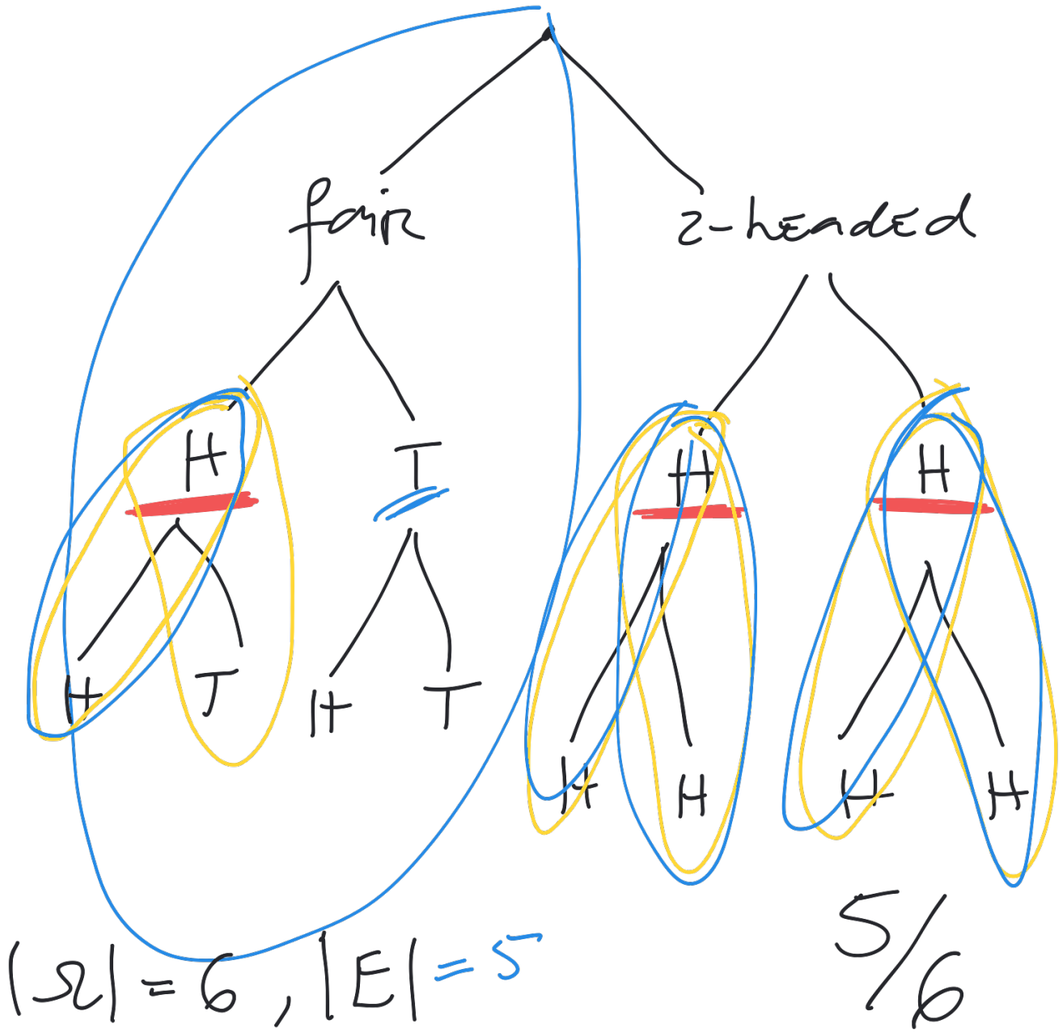


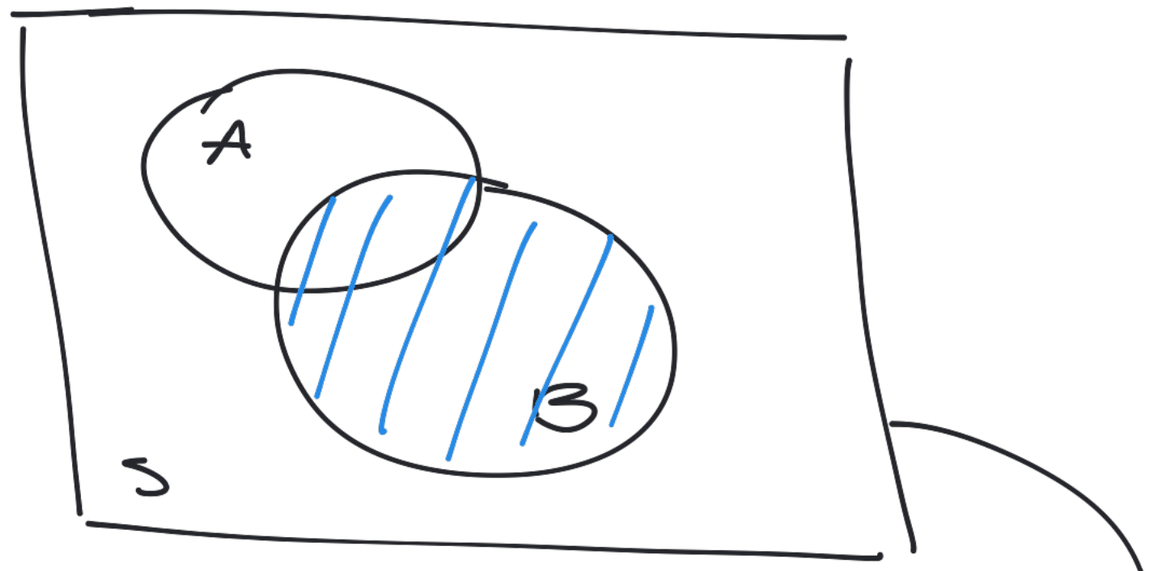
$$P(H) = \frac{3}{4}$$



$H_i \equiv$ event heads on flip i

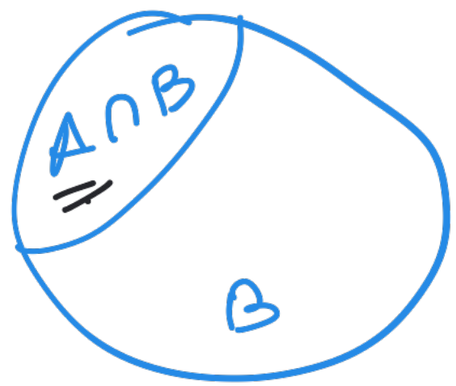
$$P(H_2 \mid H_1) = \frac{5}{6}$$

prob. of A_2 given H_1 occurred.

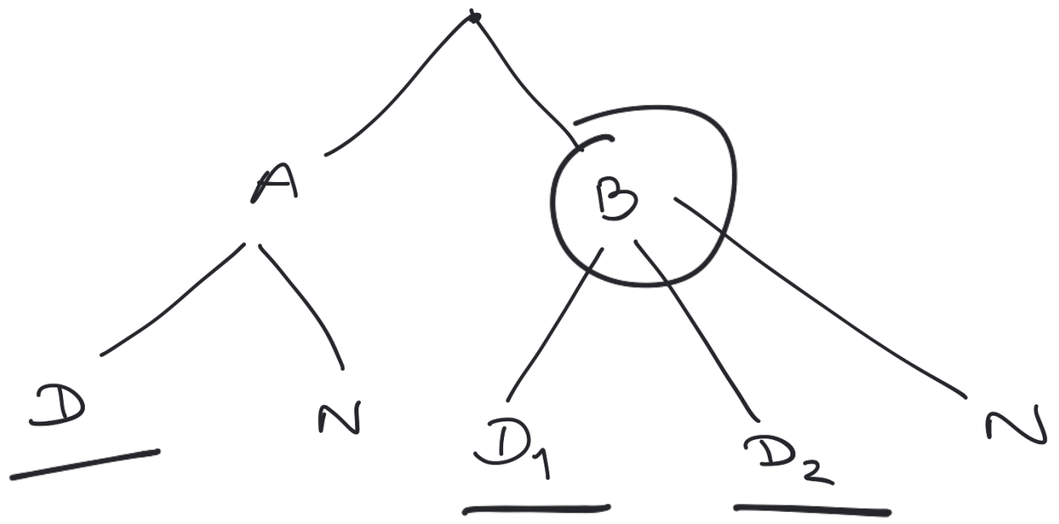


If we condition on B:

If $B \subset A$,
then if B occurs,
$P(A|B) > 0$



If $A \cap B = \emptyset$
then B occurs,
$P(A|B) = 0$



$$S = \{AD, AN, BD_1, BD_2, BN\}$$

$$P(E_A) = \frac{2}{5}$$

$$P(E_B) = \frac{3}{5}$$

$$P(E_D) = \frac{3}{5}$$

$E_A \equiv$ event select a comp. from A

$E_B \equiv$ " " " from B

$E_D \equiv$ " " a defective comp.

$$P(E_D \mid E_A) = \frac{P(E_D \cap E_A)}{P(E_A)} = \frac{1}{2}$$

$$P(E_A \mid E_D) = \frac{P(E_A \cap E_D)}{P(E_D)} = \frac{1}{3}$$

$$P(E_B \mid E_D) = \frac{2}{3}$$

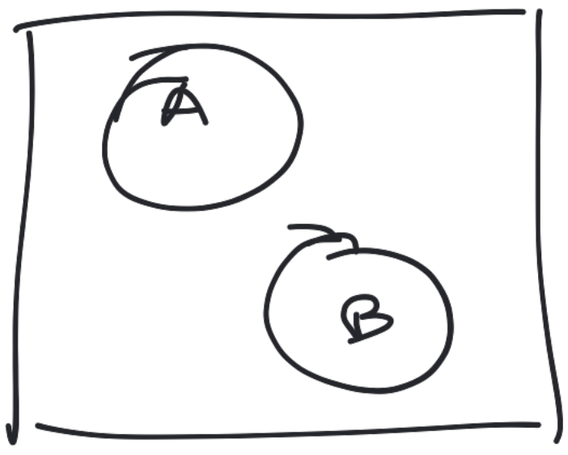
Which one is true?

① $P(A|B) \geq P(A)$

② $P(A|B) \leq P(A)$

③ Not necessarily 1 or 2 ✓

Case 1 A and B are M.E.



$A \cap B = \emptyset$

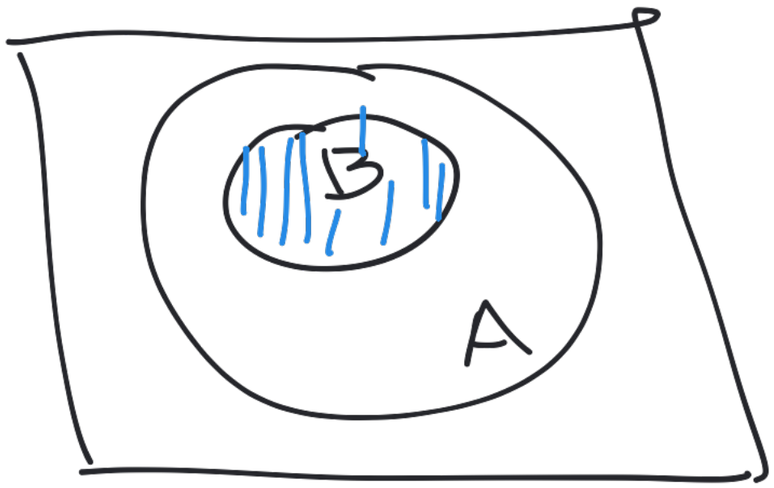
$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0}{P(A)}$$

$$= 0$$

$$\leq P(A)$$

Case 2

B ⊂ A



$$P(A \cap B) = P(B)$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(B)}{P(B)} = 1$$

$$\geq P(A)$$

flip 1	flip 2	XOR	prob.
0	0	0	1/4
0	1	1	1/4
1	0	1	1/4
1	1	0	1/4

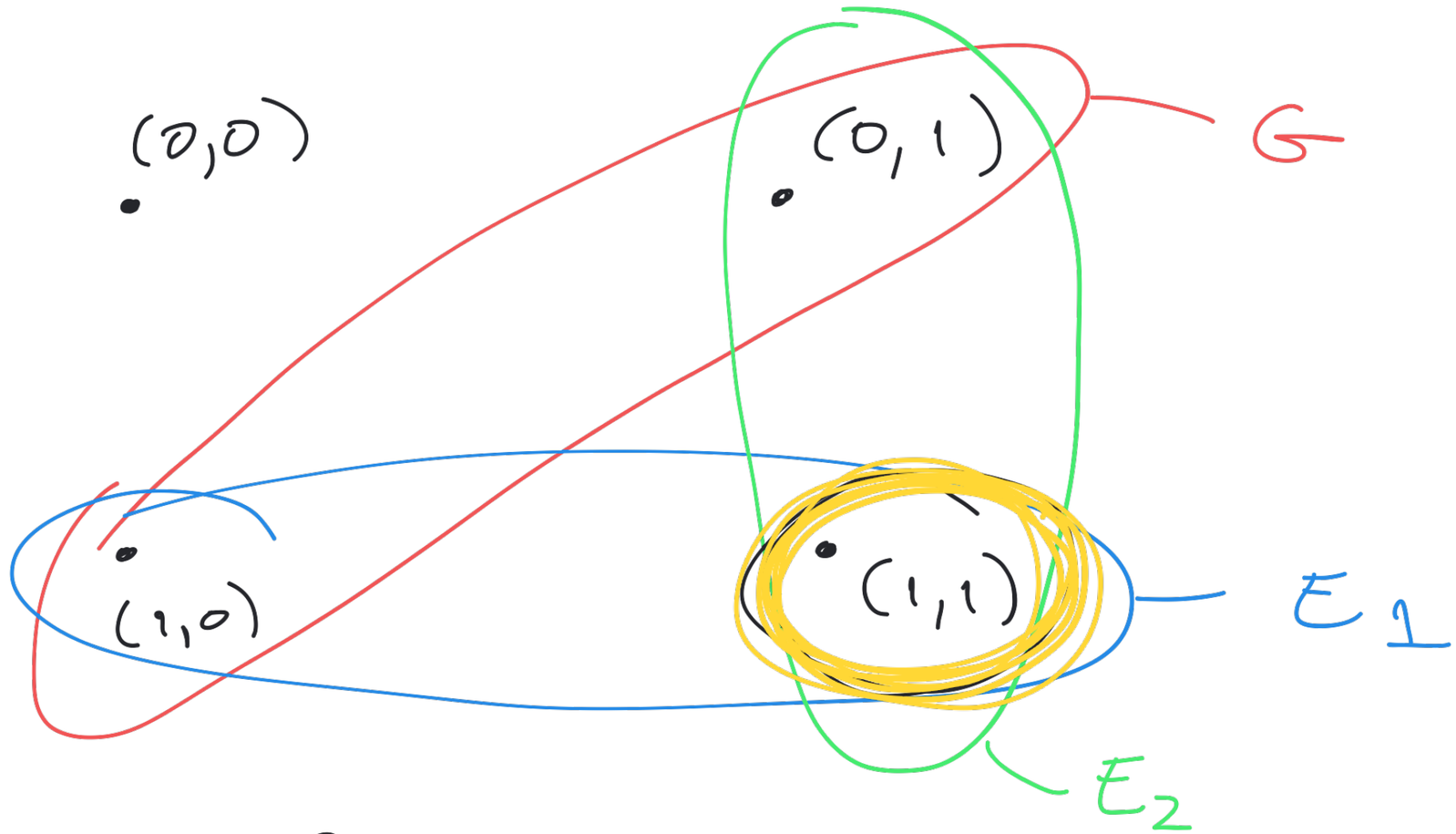
G —

E_1 —

$S = \{00, 01, 10, 11\}$

E_1 ≡ denote '1' in flip 2

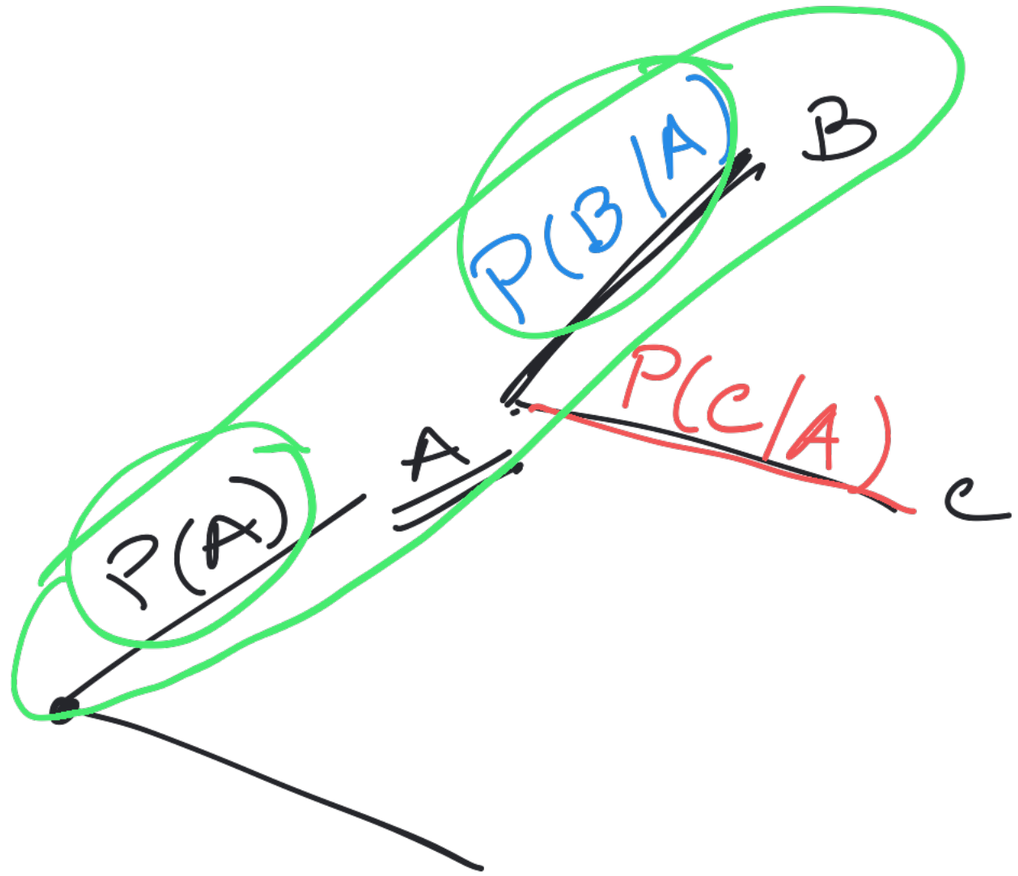
G ≡ event XOR on top face is '1'



$$P(E_1) = \frac{2}{4} = \frac{1}{2} = P(E_2) = P(G)$$

$$P(E_1 \mid E_2) = \frac{1}{2}, \quad P(E_2 \mid E_1) = \frac{1}{2}$$

$$P(G \mid E_1 \cap E_2) = 0$$



$$P(A \cap B) = P(A) \cdot P(B|A)$$

Chain Rule

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$$\Longleftrightarrow \boxed{P(A|B) \cdot P(B) = P(A \cap B)}$$

$$P(A \cap B) = \boxed{P(B \cap A) = P(B|A) \cdot P(A)}$$