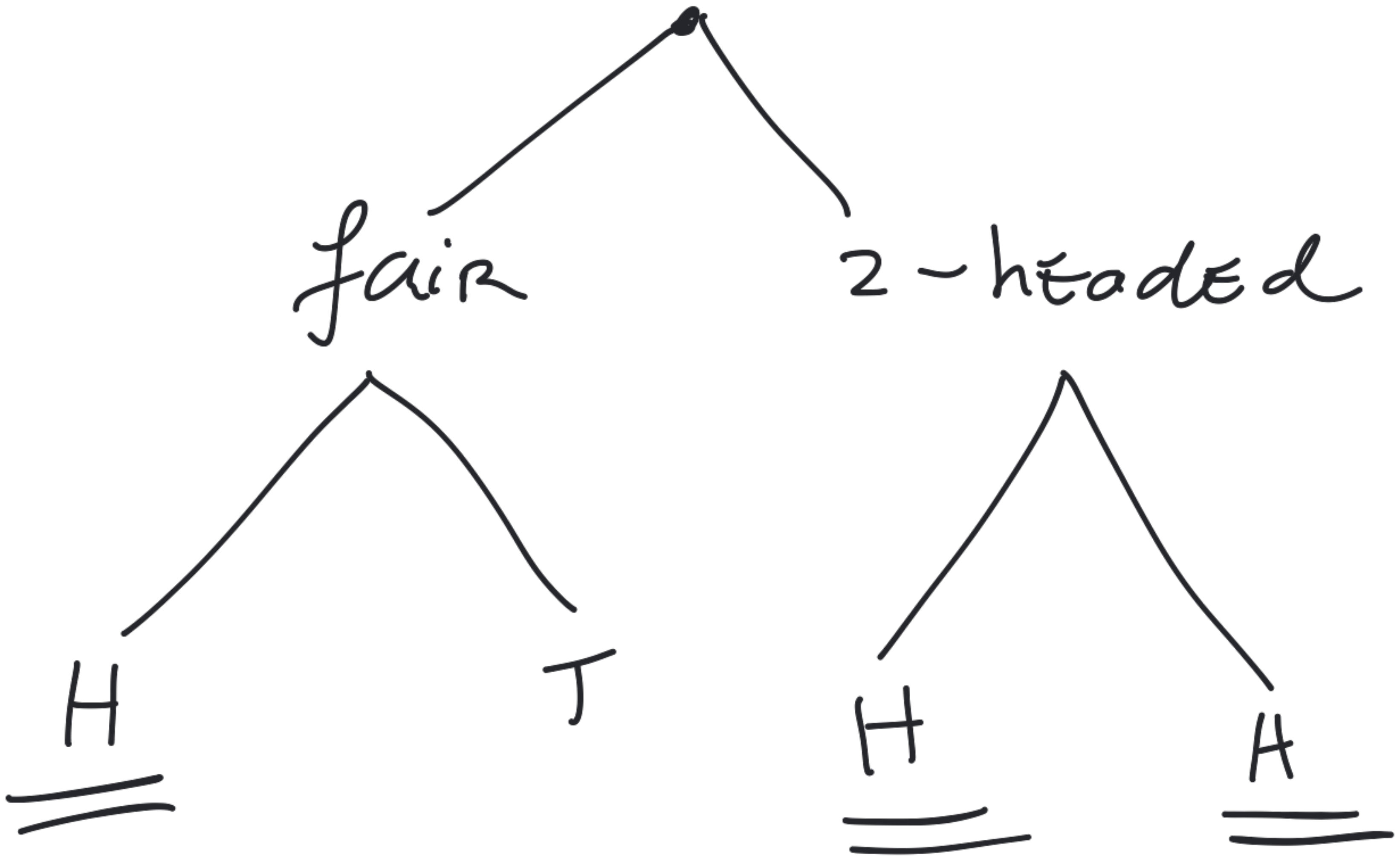
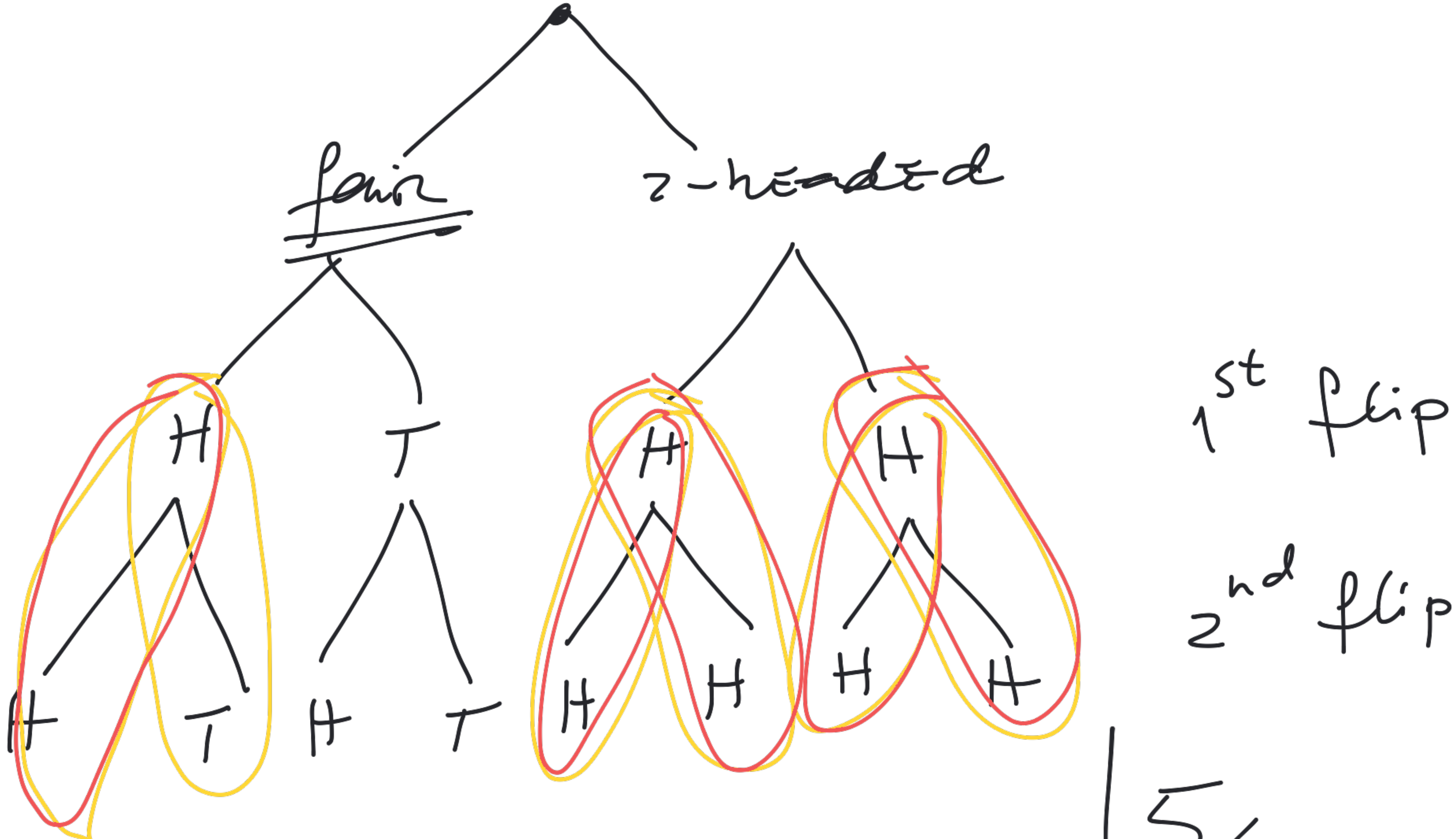


$S = \{H, T\}$

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

$P(T) = \frac{1}{4}$

Not fair experiment.

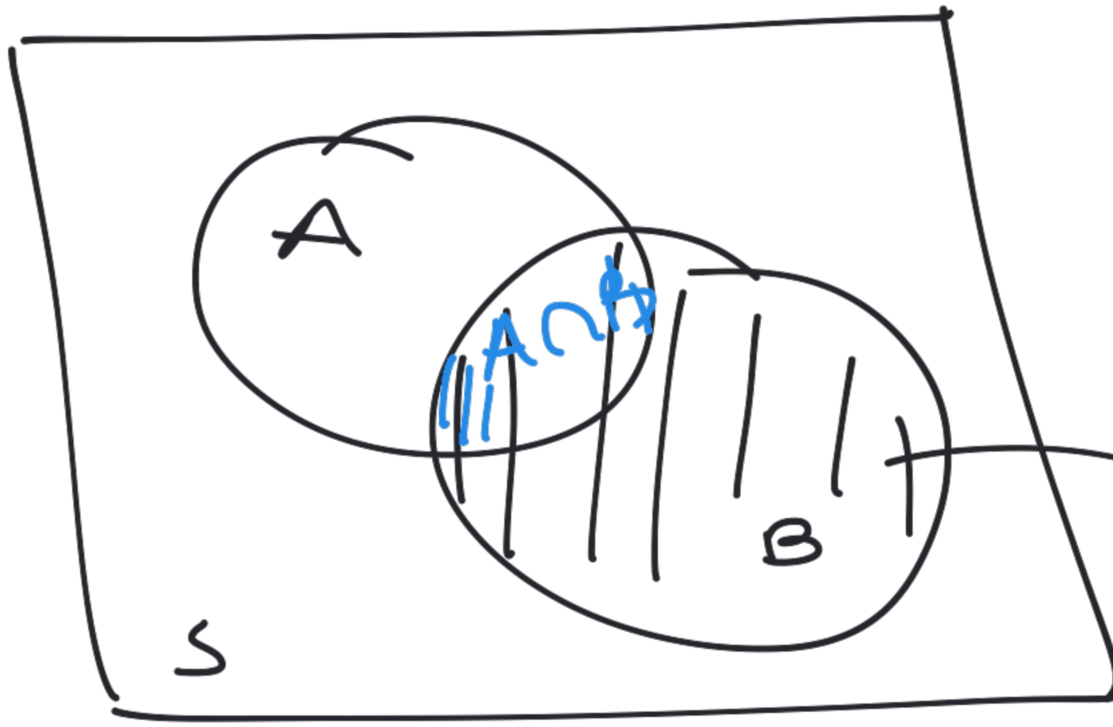


5/6

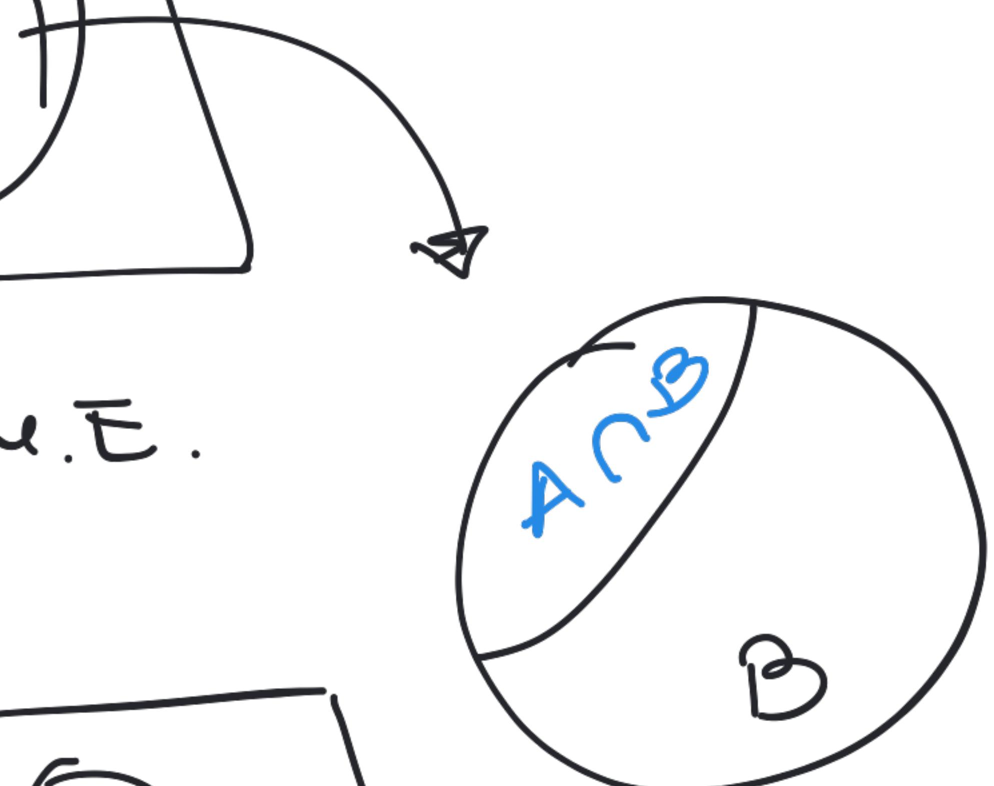
H_i = event heads occurred on flip i

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

Given $A, B \in \mathcal{F}$



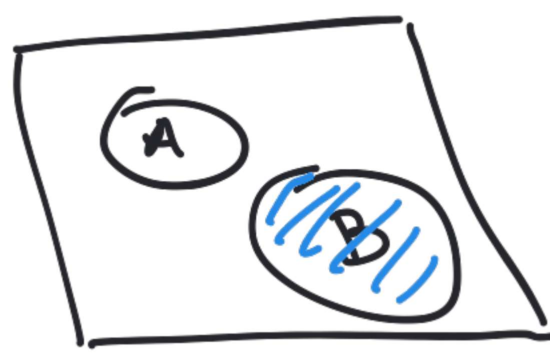
If condition on B having occurred:



① If A and B are M.E.

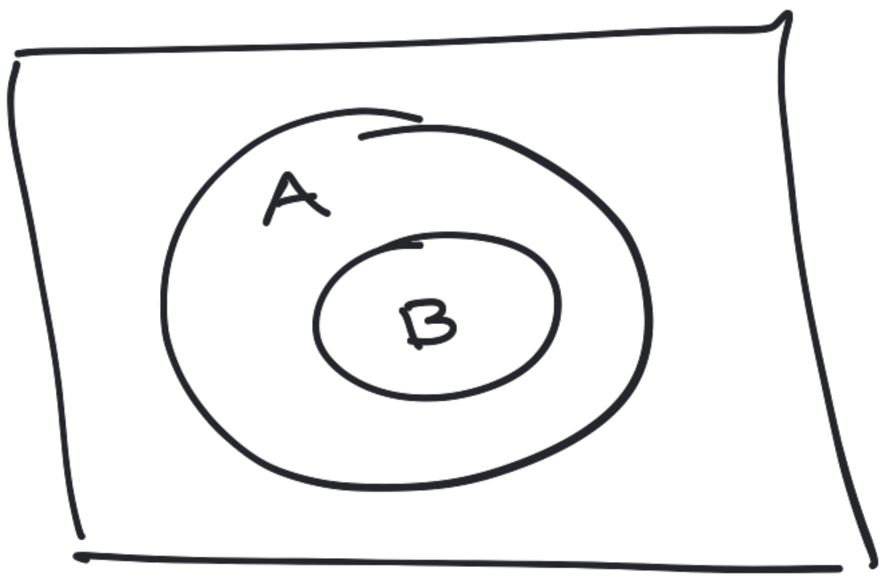
$$A \cap B = \emptyset$$

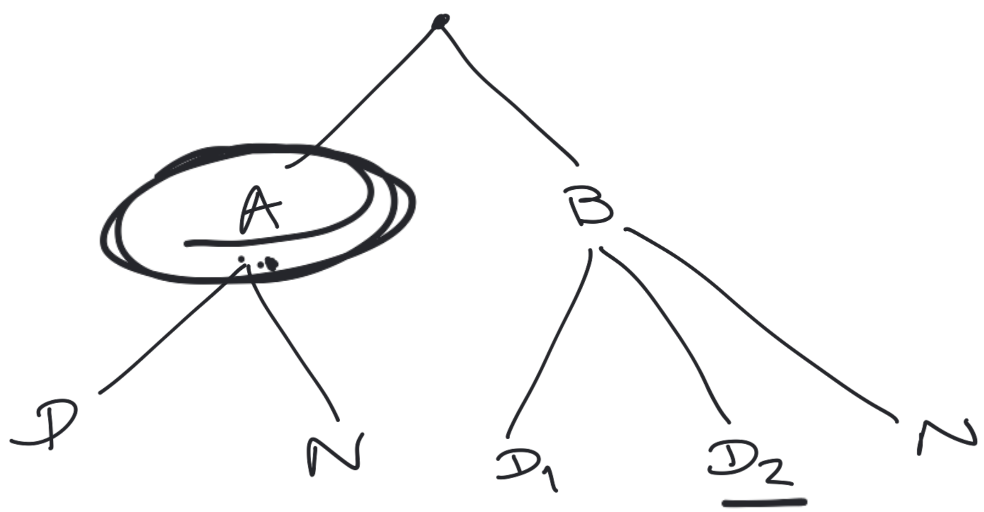
$$P(A|B) = 0$$



② $B \subset A$

$P(A|B) > 0$





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

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

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

$E_A \equiv$ event selecting comp. from A

$E_B \equiv$ event selecting comp. from B

$E_D \equiv$ " " defective comp

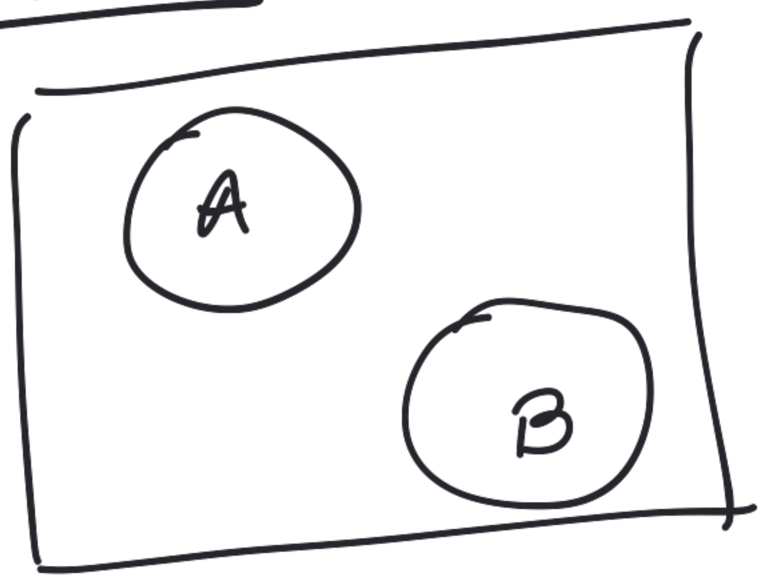
$$P(E_A) = \frac{2}{5}, \quad P(E_B) = \frac{3}{5}, \quad P(E_D) = \frac{3}{5}$$

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

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 disjoint/M.E.

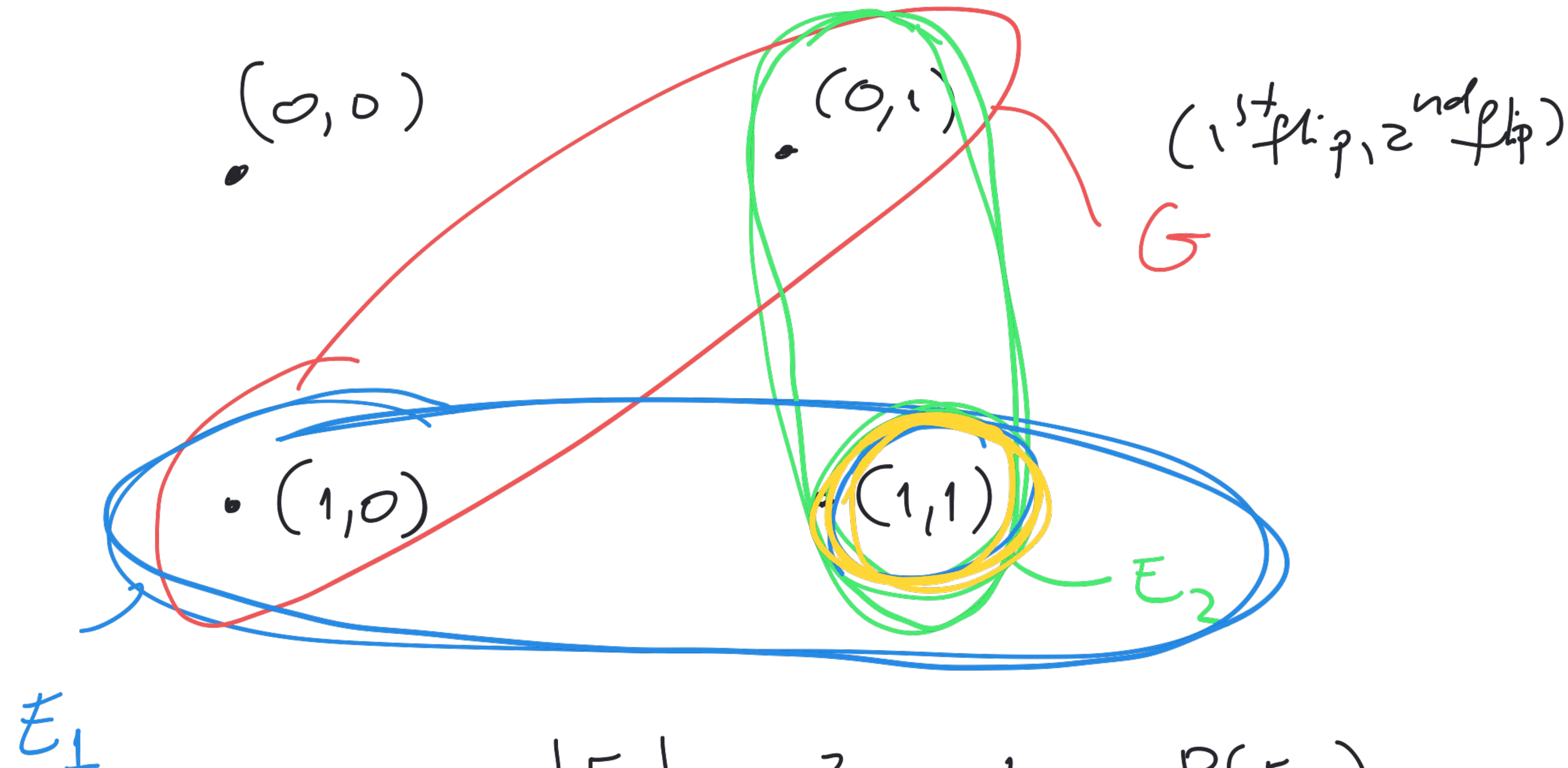


$$A \cap B = \phi$$

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

	flip 1	flip 2	XOR	prob.
	0	0	0	1/4
G	0	1	1	1/4
	1	0	1	1/4
E_1	1	1	0	1/4

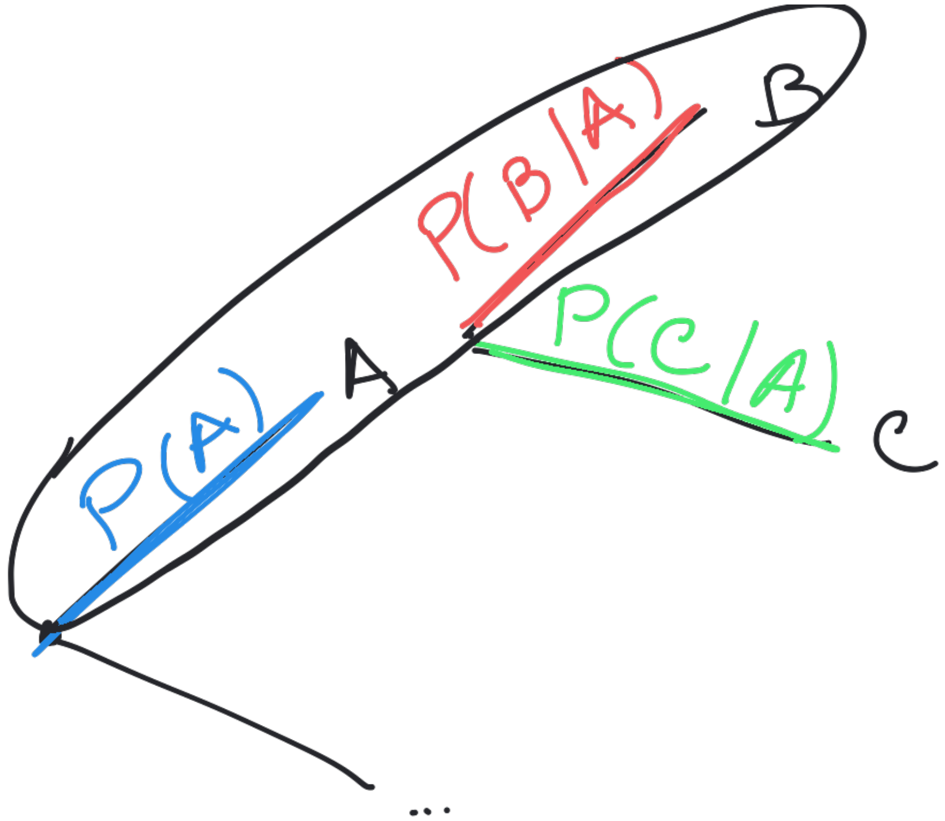
$$S = \{00, 01, 10, 11\}$$



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

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

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



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

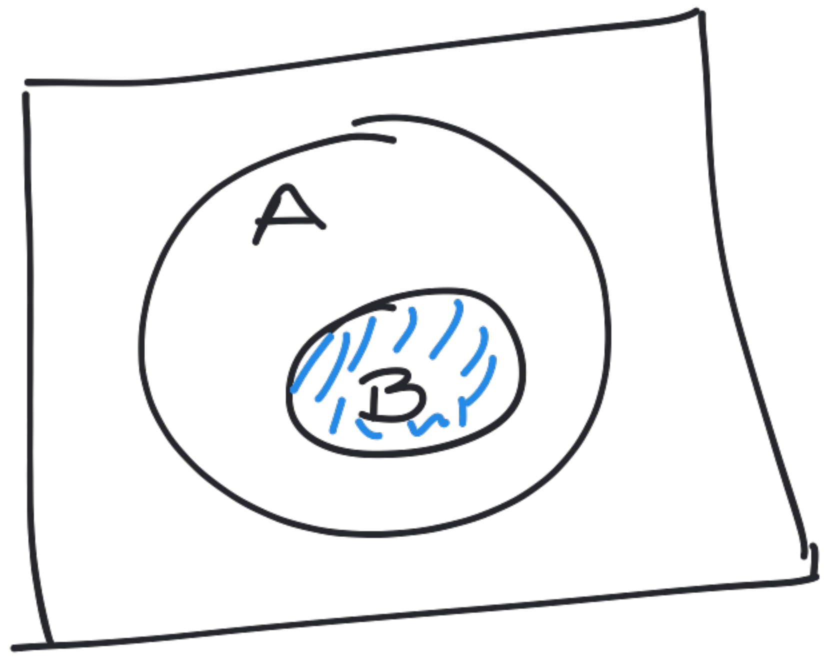
Chain Rules

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

$$P(A \cap B \cap C) = P(A) \cdot P(B \mid A) \cdot P(C \mid A \cap B)$$

$$= \cancel{P(A)} \cdot \frac{P(B \cancel{\cap A})}{\cancel{P(A)}} \boxed{\frac{P(C \cap A \cap B)}{\cancel{P(A \cap B)}}}$$

Case 2: $B \subset A$



$A \cap B = B$

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

$$= 1 \geq P(A)$$