Bag of Coins Problem (Solution #1)

$c1 = HT, \quad c2 = HH, \quad c3 = TT$

R.V.s: $C = \{c1, c2, c3\}$, $\quad F_1 = \{H, T\}$, $\quad F_2 = \{H, T\}$

the coins in the bag

the result of the first flip

the result of the second flip

We want to know: $P(F_2 = H \mid F_1 = H) = ?$

Use def. of cond. probability: $P(F_2 = H \mid F_1 = H) = \dfrac{P(F_2 = H \cap F_1 = H)}{P(F_1 = H)}$

→ subproblem: $P(F_1 = H) = ?$

use LoTP:

$$= P(F_1 = H \mid C = c1)P(C = c1) + P(F_1 = H \mid C = c2)P(C = c2) + P(F_1 = H \mid C = c3)P(C = c3)$$

$$= \tfrac{1}{2} \cdot \tfrac{1}{3} + 1 \cdot \tfrac{1}{3} + 0 \cdot \tfrac{1}{3} = \frac{1}{6} + \frac{2}{6}$$

$$= \frac{1}{2}$$

→ subproblem: $P(F_2 = H \cap F_1 = H) = ?$

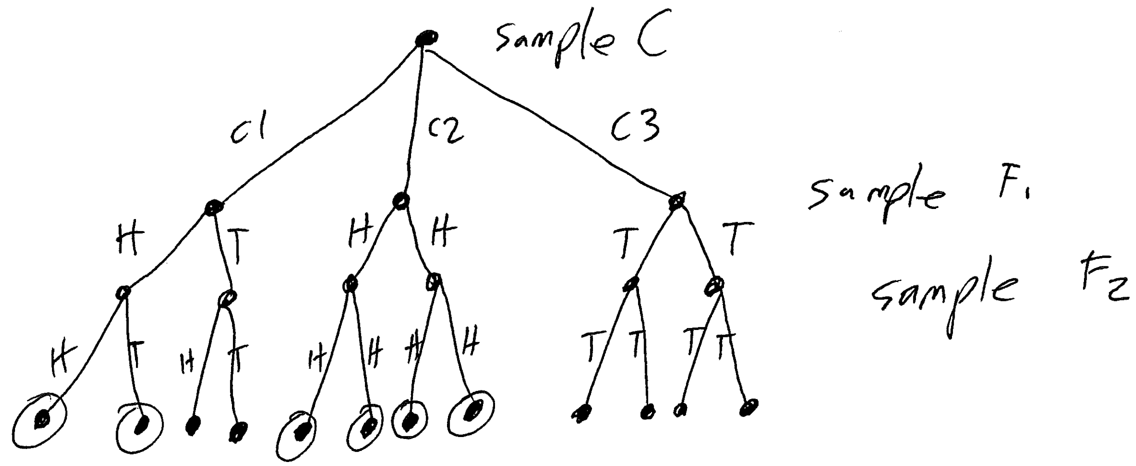
use LoTP:

$$= P(F_2 = H \cap F_1 = H \mid C = c1)\, P(C = c1) + P(F_2 = H \cap F_1 = H \mid C = c2)\, P(C = c2) + P(F_2 = H \cap F_1 = H \mid C = c3)\, P(C = c3)$$

$$= \tfrac{1}{4} \cdot \tfrac{1}{3} + 1 \cdot \tfrac{1}{3} + 0 \cdot \tfrac{1}{3} = \frac{1}{12} + \frac{4}{12} = \frac{5}{12}$$

$$P(F_2 = H \mid F_1 = H) = \tfrac{5}{12} \div \tfrac{1}{2} = \boxed{5/6}$$

Bag of Coins Problem (Solution #2)



(circled above)

given $F_1 = H$, we can only be in these six leaves

Five of those six leave have $F_2 = H$.

So, the answer is $\boxed{5/6}$