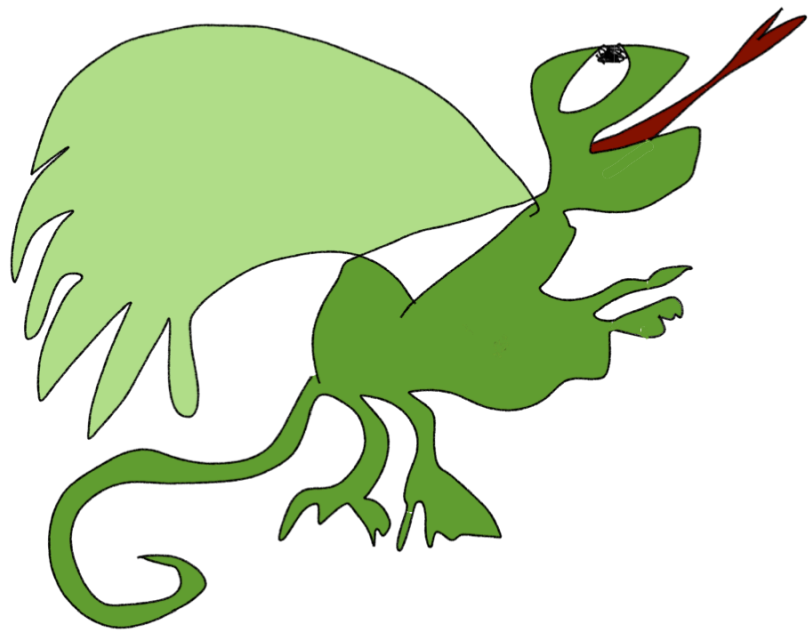
MGT 403 - Lecture 1



1 2

Outcomes = $\{H_1H_2, H_1T_2, T_1H_2, T_1T_2\}$

A = at least 1 heads

A = $\{H_1H_2, H_1T_2, T_1H_2\}$

B = Second coin is heads

B = $\{H_1H_2, T_1H_2\}$

A = at least 1 heads

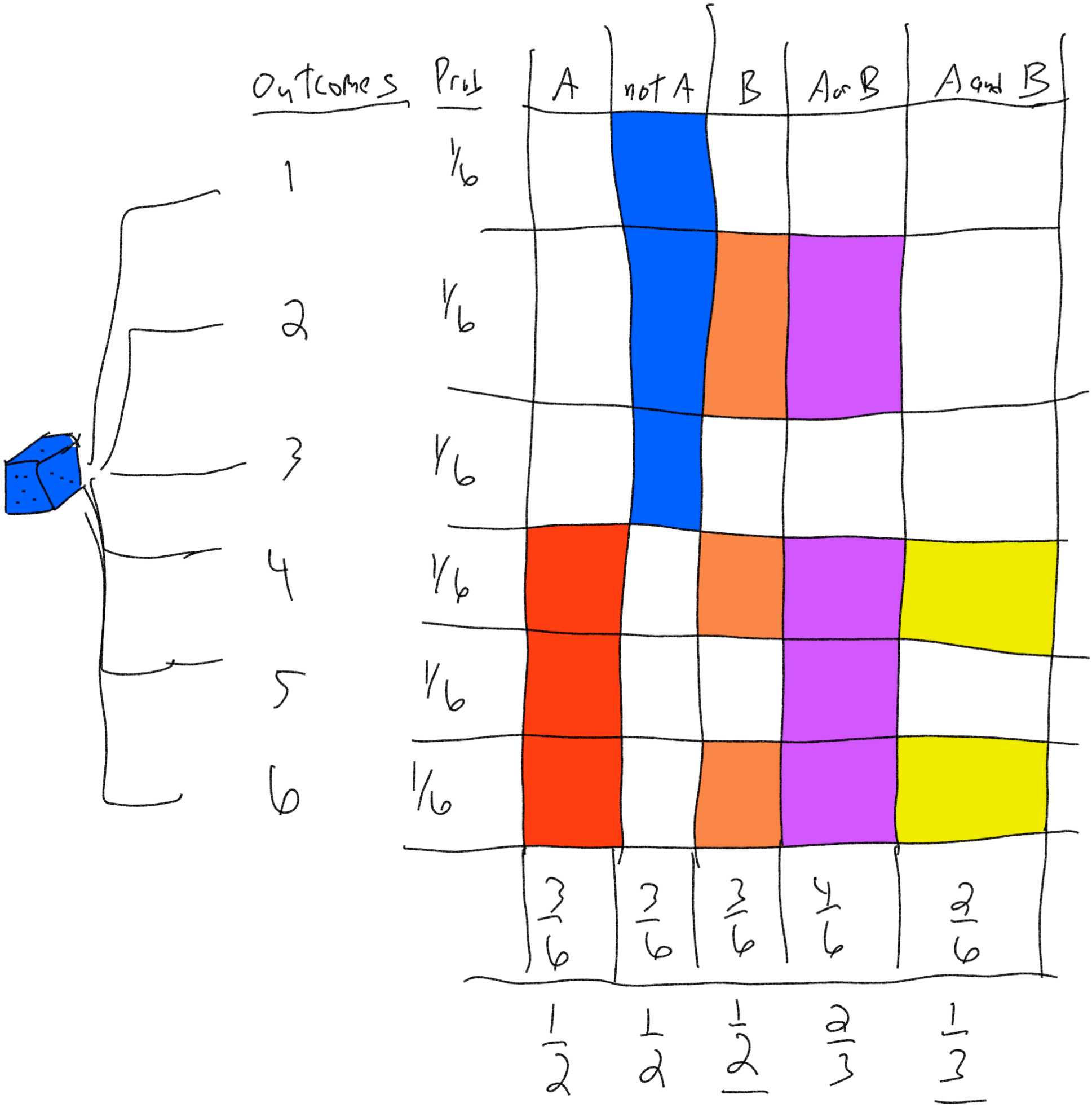
$A = \{H_1H_2, H_1T_2, T_1H_2\}$

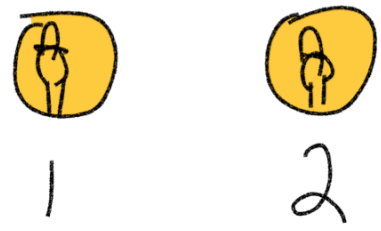
$P(A) = P(H_1H_2) + P(H_1T_2) + P(T_1H_2)$

$P(S) = 1 = P(HH) + P(HT) + P(TH) + P(TT)$

$P(HH) = \frac{1}{4} = P(HT) = P(TH) = P(TT)$

$P(A) = 3 \times \frac{1}{4} = \frac{3}{4}$


Outcomes
Prob
A
not A
B
A or B
A and B
1
2
3
4
5
6
1/6
1/6
1/6
1/6
1/6
1/6
3/6
3/6
3/6
4/6
2/6
1/2
1/2
1/2
2/3
1/3



A = at least one head

$P(A) = 1 - P(\bar{A}) = 1 - P(\text{not } A)$

$\bar{A} = \{TT\}$

$P(A) = 1 - \frac{1}{4} = \frac{3}{4}$

B = First coin heads

$P(B) = P(HH) + P(HT)$

$= \frac{1}{4} + \frac{1}{4}$

$= \frac{2}{4} = \frac{1}{2}$

$P(A \text{ and } B) = P(HT) + P(HH)$

$= \frac{1}{4} + \frac{1}{4}$

$= \frac{2}{4} = \frac{1}{2}$

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$= \frac{3}{4} + \frac{1}{2} - \frac{1}{2} = \frac{3}{4}$

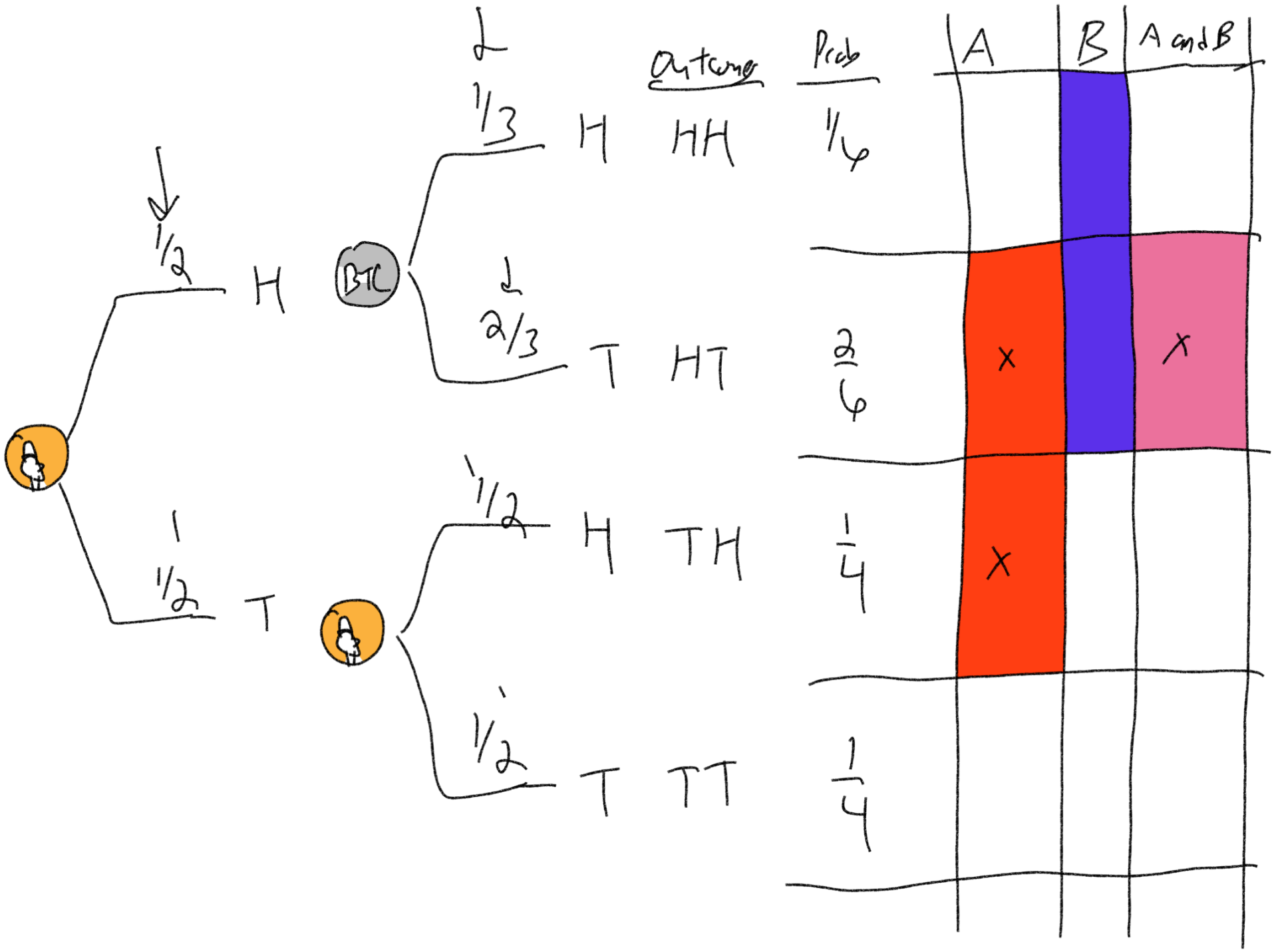
$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{\frac{1}{3}}{\frac{1}{2}} = \frac{2}{3}$$

$S = \{1, 2, 3, 4, 5, 6\}$

$B = \{2 \quad 4 \quad 6\}$ → 3 outcomes

$A = \{4, 5, 6\}$

$A|B = \{4 \quad 6\}$ → 2 outcomes



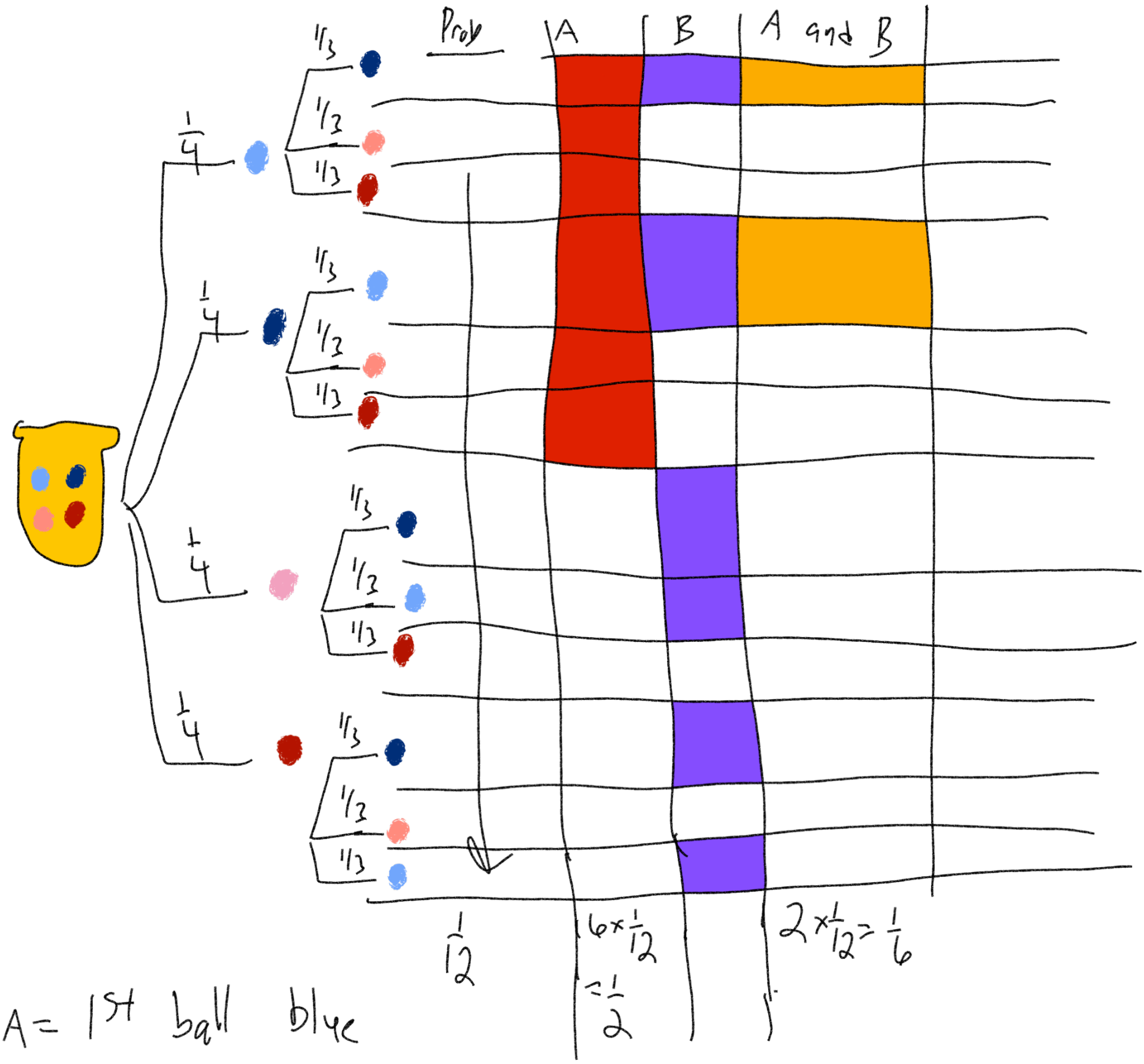
A = tosses are different

B = 1st toss heads

$$P(B \mid A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{\frac{2}{6}}{\frac{2}{6}+\frac{1}{4}}$$

$$= \frac{\frac{1}{3}}{\frac{1}{3}+\frac{1}{4}} = \frac{\frac{1}{3}}{\frac{4+3}{12}} = \frac{\frac{1}{3}}{\frac{7}{12}}$$

$$= \frac{12}{3} \cdot \frac{1}{7} = \boxed{\frac{4}{7}}$$



A = 1st ball blue

B = 2nd ball blue

$$P(B \mid A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{\frac{1}{6}}{\frac{1}{2}} = \frac{2}{6} = \frac{1}{3}$$ ✓