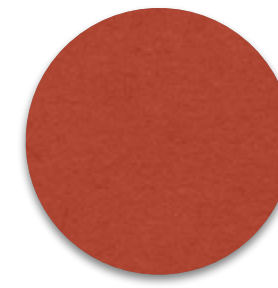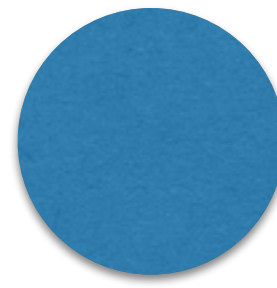# Probability Identities

- Random variables in caps (**A**)

  - values in lowercase: **A = a** or just **a** for shorthand

- $P(a \mid b) = P(a, b) / P(b)$ conditional probability

- $P(a, b) = P(a \mid b) \, P(b)$ joint probability
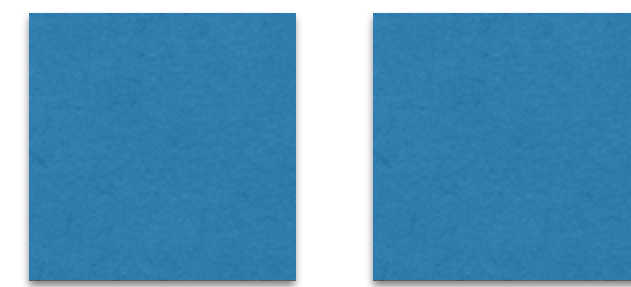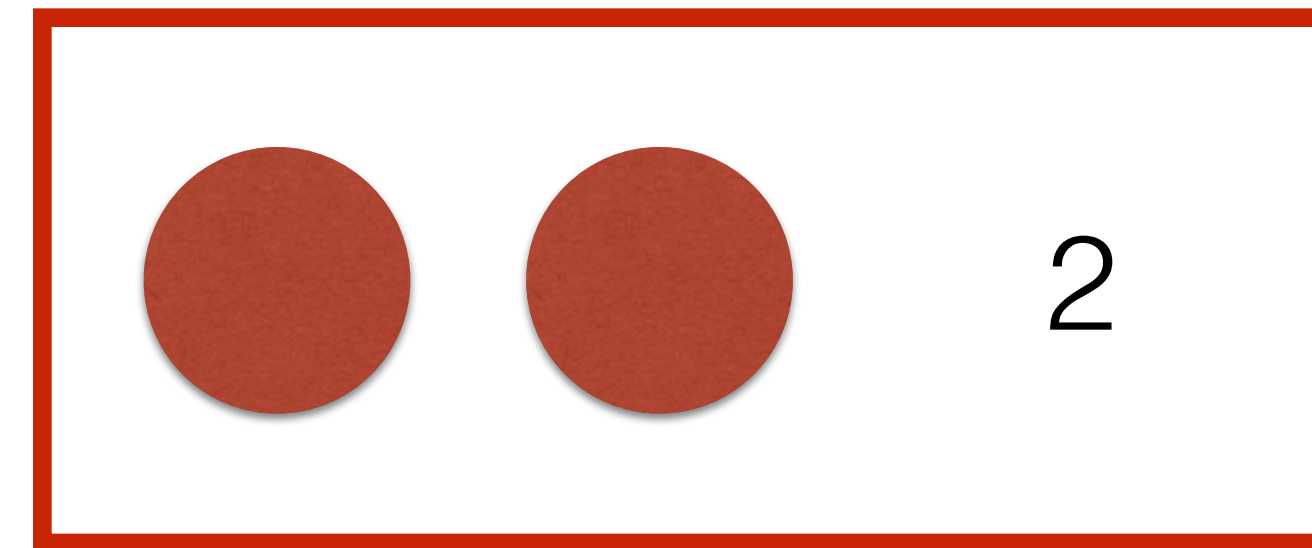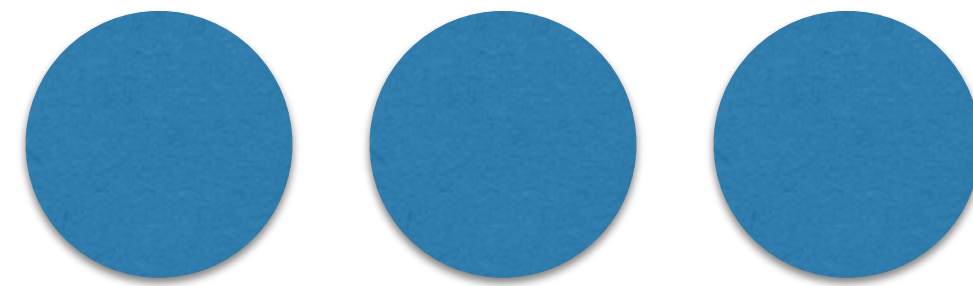
- $P(b \mid a) = P(a \mid b) \, P(b) / P(a)$
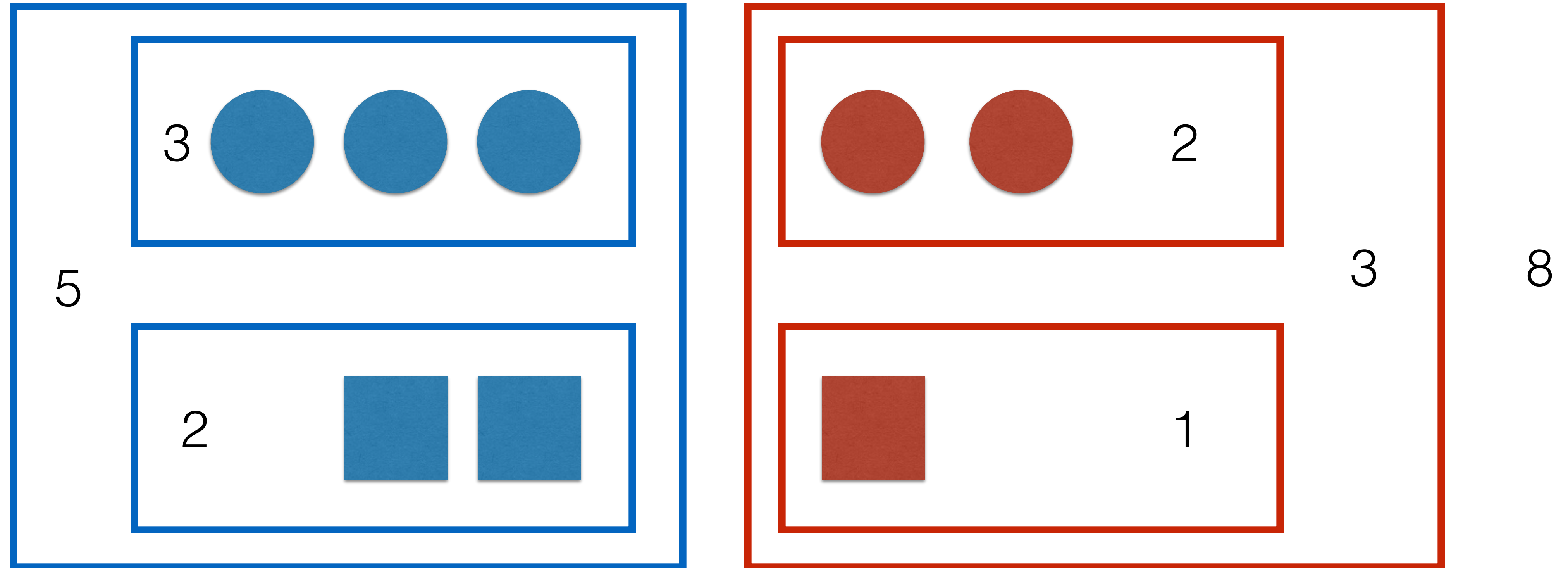
Probability via Counting

Probability via Counting

P(circle, red)

=2/8 = 0.25

2

8

Probability via Counting

P(circle | red) = P(circle, red) / P(red)

2/3   2/8   3/8

Probability via Counting
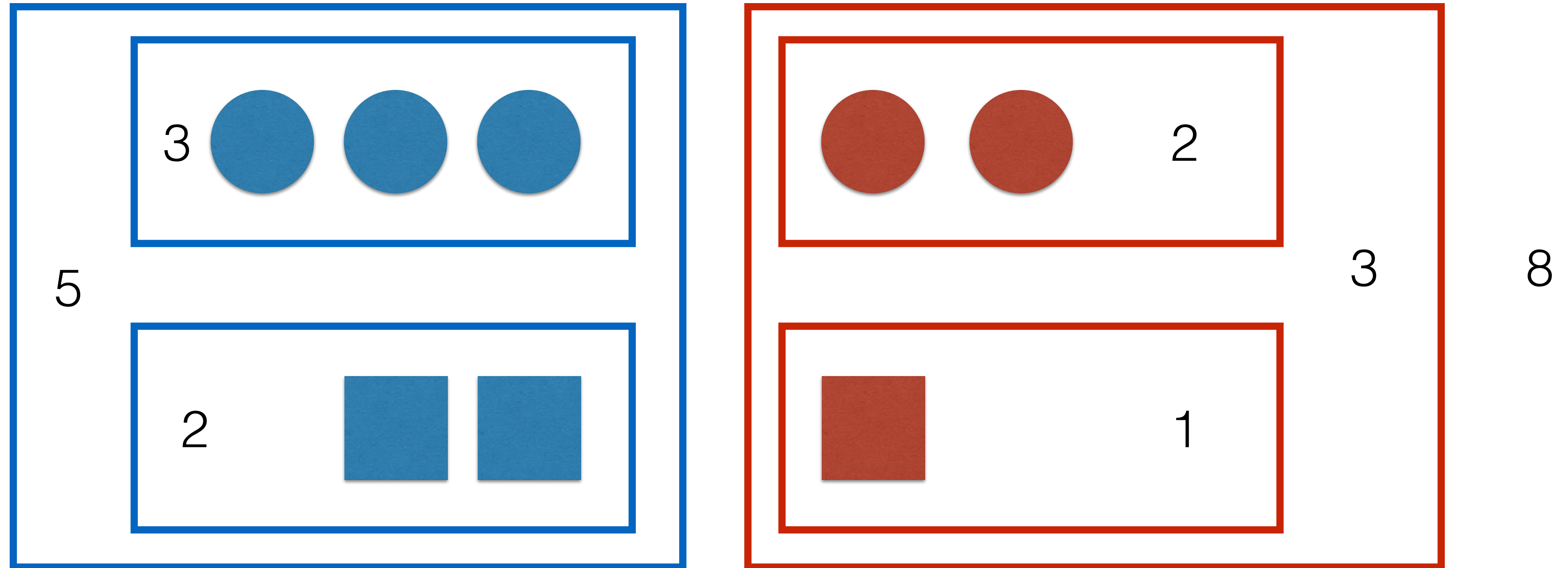
P(circle | red) P(red) = P(circle, red)

2/3   3/8   2/8

Probability Identities

- Random variables in caps (**A**)

  - values in lowercase: **A = a** or just **a** for shorthand

- $P(a \mid b) = P(a, b) / P(b)$

- $P(a, b) = P(a \mid b) \, P(b)$

- $P(b \mid a) = P(a \mid b) \, P(b) / P(a)$

Bayes Rule

- P(b | a)

- P(b | a) = P(a, b) / P(a)

- P(b | a) = P(a | b) P(b) / P(a)