Conditional probability

- A, B, Ω
- $P(A), P(B)$
- We know that B occured. What is the probability that A also occured?

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

B occured

$\Omega = \{1,2,3,4,5,6\}$ $\quad A = \{1,2\}$ $\quad P(A) = \frac{1}{3}$

$B = \{2,3\}$ $\quad P(B) = \frac{1}{3}$

$A \cap B = \{2\}$

$P(A \cap B) = \frac{1}{6}$

I know that B occured

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{1/6}{1/3} = 0.5$$

- $P(\text{throw 2 3s} \mid \text{first is 3})$

A: 2 3s $= \{(3,3)\}$ $\quad P(A) = \frac{1}{36}$

B: 1st is 3 $= \{(3,1),(3,2),(3,3),(3,4),(3,5),(3,6)\} = \frac{6}{36} = \frac{1}{6}$

$A \cap B = \{(3,3)\}$ $\quad P(A \cap B) = \frac{1}{36}$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{1/36}{1/6} = \underline{\underline{\frac{1}{6}}}$$

- Monty Hall Problem