

6	13	7
12	10	5
3	1	4
15	8	11

Probability Spaces



6	13	7
12	10	5
3	1	4
15	8	11

Probability Spaces

- 1) **Sample space**: a **countable** set \mathcal{S} whose elements are called **outcomes**
- 2) **Probability function**,

$\text{Pr}: \mathcal{S} \rightarrow [0, 1]$, such that

$$\sum_{\omega \in \mathcal{S}} \text{Pr}[\omega] = 1$$



6	13	7
12	10	5
3	1	4
15	8	11

Probability Spaces

The purpose of the "tree model" is to figure out which probability space to use:

- outcomes = leaves of tree
- outcome probabilities calculated from branch probabilities.



6	13	7
12	10	5
3	1	4
15	8	11

Probability Spaces

An **event** is a subset, $E \subseteq \mathcal{S}$.

$$\text{Pr}[E] ::= \sum_{\omega \in E} \text{Pr}[\omega]$$

Cor: The **Sum Rule**



6	13	7
12	10	5
3	1	4
15	8	2

Sum Rule

For pairwise disjoint A_0, A_1, \dots

$$\Pr[A_0 \cup A_1 \cup A_2 \cup \dots] = \Pr[A_0] + \Pr[A_1] + \Pr[A_2] + \dots$$



Albert R Meyer,

May 1, 2012

samplespace.5

6	13	7
12	10	5
3	1	4
15	8	2

Sum Rule

For pairwise disjoint A_0, A_1, \dots

$$\Pr\left[\bigcup_{i \in \mathbb{N}} A_i\right] = \sum_{i \in \mathbb{N}} \Pr[A_i]$$



Albert R Meyer,

May 1, 2012

samplespace.6

6	13	7
12	10	5
3	1	4
15	8	2

Discrete Probability

Discrete = countable
sample space

Allows sums instead
of integrals



Albert R Meyer,

May 1, 2012

samplespace.7

MIT OpenCourseWare
<http://ocw.mit.edu>

6.042J / 18.062J Mathematics for Computer Science
Spring 2015

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.