

- Tim / Prof. / Prof. Chumley (he/him)
- Moodle - announcements, Q and A forum
- Webpage (tchumley.mtholyoke.edu/m342)
 - notes, worksheets, homework, syllabus
 - updated daily
- Homework (weekly)
 - submitted on Gradescope
 - due Fridays at 5 pm
 - redos (details to be announced)
- Quizzes - (mostly) weekly on Fridays, 15 minutes
- Exams - two during semester, one during finals, in-class
- Participation - come to class, be a good community member, stay in touch when something goes wrong (eg. illness)
- Office hours (tentative)
 - Mondays 11:15-12:15
 - Tuesdays 4:00-5:00
 - Thursdays 1:15-2:15

} drop in (Clapp 423),
no appointment necessary

S 1.1 - 1.3 Introduction

Def A random experiment is a process with an uncertain outcome. For a given random experiment, the set of all possible outcomes is called the sample space, which could be a finite or infinite set. An event is a subset of the sample space.

Example Consider the random experiment of rolling two dice.

- (1) List the outcomes in the sample space Ω^{omega} .
- (2) How many outcomes are there in the event A that the sum of the dice is 5? 6?
- (3) How many outcomes in the event B that at least one die lands on 1?

(4) We can make a table to list every outcome:

		die 2						
		1	2	3	4	5	6	
die 1		1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
		2	(2,1)	...				
3	(3,1)		.	.	.			
4	(4,1)		:					
5	(5,1)							
6	(6,1)							

Or we can use set notation: integers

$$\Omega = \left\{ (x_1, x_2) : x_1, x_2 \in \mathbb{Z}, 1 \leq x_1 \leq 6, 1 \leq x_2 \leq 6 \right\}$$

↑ ↓
"such that" "in"

$$\textcircled{2} \quad A = \{(1,4), (4,1), (2,3), (3,2)\}$$

$|A| = 4$ absolute value bars on a set mean "size of" or "number of elements in"

$$\textcircled{3} \quad B = \{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,1), (3,1), (4,1), (5,1), (6,1)\}$$

$$|B| = 11.$$

Def Given a random experiment, a probability function $P : \underline{\Omega} \rightarrow [0, 1]$ is a function with the following properties:

\textcircled{1} for any outcome $w \in \underline{\Omega}$, $P(w) \geq 0$ outcomes have non-negative probability

\textcircled{2} $\sum_{w \in \underline{\Omega}} P(w) = 1$ outcome probabilities sum to 1

\textcircled{3} for any event $A \subseteq \underline{\Omega}$, $P(A) = \sum_{w \in A} P(w)$ probability of an event is the sum of its outcome probabilities

Remark When all outcomes in $\underline{\Omega}$ are equally likely,

$$\textcircled{1} \quad P(w) = \frac{1}{|\underline{\Omega}|} \quad \text{for any outcome } w \in \underline{\Omega}$$

$$\textcircled{2} \quad P(A) = \frac{|A|}{|\underline{\Omega}|} \quad \text{for any event } A \subseteq \underline{\Omega}.$$

Example Let C be the event that the sum of two dice rolled is 6. Find $P(C)$.

Note $C = \{(1,5), (5,1), (2,4), (4,2), (3,3)\}$.

$$\text{Therefore } P(C) = \frac{|C|}{|\underline{\Omega}|} = \frac{5}{36}.$$