

EE 131A  
Probability and Statistics  
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Homework 1  
Monday, January 4, 2021  
Due: Monday, January 11, 2021  
before class begins  
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**Please upload your homework to Gradescope by January 11, 3:59 pm.**

**Please submit a single PDF directly on Gradescope**

**You may type your homework or scan your handwritten version. Make sure all the work is discernible.**

Reading: Chapter 2.1-2.3 of *Probability, Statistics, and Random Processes* by A. Leon-Garcia

1. Two dice are tossed and the magnitude of the difference in the number of dots facing up in the two dice is noted.
  - (a) What is the sample space of the event of tossing of the two dice?
  - (b) Find the subset  $A$  of the sample space corresponding to the event “magnitude of difference is 3.” Also, find the probability of the event corresponding to set  $A$ .
2. Let  $A$ ,  $B$ , and  $C$  be three events. Find an expression and draw a Venn diagram for the following events:
  - (a) Two or more of the events occur.
  - (b) None of the events occur.
  - (c) Exactly one of the three events occurs.
3. Suppose  $A$  and  $B$  are two events. Use the axioms of probability to prove the following:
  - (a)  $P(A \cap B) \geq P(A) + P(B) - 1$ .
  - (b)  $P(A \cup B \cup C) \leq P(A) + P(B) + P(C)$ .
4. Five balls are placed at random in five buckets. What is the probability that each bucket has a ball?
5. There is a deck of 4 white cards, 3 blue cards, and 5 red cards.
  - (a) If we randomly take 5 cards from this deck, what is the probability that exactly 2 of them are white?
  - (b) If we randomly take 5 cards from this deck, what is the probability that at least 2 of them are white?

6. A fair coin is tossed four times. Find the probabilities of the following events:

(a) seeing at least two successive tails.

(b) seeing exactly one head in the first three tosses.

Do the answers to (a) and (b) change if we toss the coin more than four times?