Recitation 8: Probability

1 Probability spaces

Problem 1. I choose 3 numbers at random from [10] (allowing repeats). What is the probability space (Ω, P)? What is the probability that all 3 numbers that I choose are different?

2 Conditional probability and independence

Problem 2. I roll 3 dice. Can you give examples of events A and B that are:

(a) Mutually exclusive but not independent?

(b) Independent but not mutually exclusive?

(c) Neither?

(d) Both?

Problem 3. In lecture, we stated and used the fact that, for events A and B,

$$P(\overline{A} \mid B) = 1 - P(A \mid B).$$

Prove this fact using the basic definitions of probability (and set operations).

Problem 4. There are three types of cars on the road, with different levels of reliability.

- 50% of cars are type 1. On any given day there is a 1/100 chance it breaks down.
- 30% of cars are type 2. On any given day there is a 1/200 chance it breaks down.
- 20% of cars are type 3. On any given day there is a 1/20 chance it breaks down.

A customer brings a broken-down car to the mechanic. What is the probability that it is a type 1 car? Type 2? Type 3?