

Homework 1

(due Thursday, October 2nd)

Please make sure to fully justify your answers.

0. Make sure that you have a [Gradescope](#) account linked to your [@ucsd.edu](#) email address. Find the Gradescope page for Math 180A and upload your assignment. If you cannot find the course Gradescope page, then you may need a course entry code **EE8JK5**.
1. Suppose one rolls a standard six-sided die. Then, the sample space is $\Omega = \{1, 2, 3, 4, 5, 6\}$. Is 2 an outcome? Is 2 an event?
2. (ASV¹, Exercice 1.2)
For breakfast Bob has three options: cereal, eggs or fruit. He has to choose exactly two items out of the three available (where order does not matter).
 - (a) Describe the sample space of this experiment.
Hint: What are the different possible outcomes for Bob's breakfast?
 - (b) Let A be the event that Bob's breakfast includes cereal. Express A as a subset of the sample space.
3. (ASV, Exercice 1.3)
 - (a) You flip a (fair) coin and roll a (standard six-sided) die. Describe the sample space of this experiment.
 - (b) Now each of 10 people flips a (fair) coin and rolls a (standard six-sided) die. Describe the sample space of this experiment. How many elements are in the sample space?
 - (c) In the experiment of part (b), how many outcomes are in the event where nobody rolled a five? How many outcomes are in the event where at least one person rolled a five?
4. (ASV, Exercice 1.5)
In one type of state lottery five distinct numbers are picked from $1, 2, \dots, 40$ uniformly at random (where order does not matter).
 - (a) Describe a sample space Ω and a probability measure P to model this experiment.
 - (b) What is the probability that out of the five picked numbers, exactly three will be even?

Please round your answers to three decimal places.

5. (ASV, Exercice 1.7)
We have an urn with three green and four yellow balls. We draw three balls one by one without replacement.
 - (a) Find the probability that the colors we see in order are green, yellow, green.
 - (b) Find the probability that our sample of three balls contains two green balls and one yellow ball (where order does not matter).

Please round your answers to three decimal places.

¹*Introduction to Probability*, by David F. Anderson, Timo Seppäläinen, and Benedek Valkó

6. (ASV, Exercice 1.8)

Suppose that a bag of scrabble tiles contains five Es, four As, three Ns, and two Bs. It is my turn and I draw four tiles from the bag without replacement. Assume that my draw is uniformly random. Let C be the event that I got two Es, one A and one N.

- (a) Compute $P(C)$ by imagining that the tiles are drawn one by one as an ordered sample.
- (b) Compute $P(C)$ by imagining that the tiles are drawn all at once as an unordered sample.