

Due: Wednesday, September 20th (9:30 a.m. PT.)

**Update:** Submission is via Crowmark. Note that two questions are numbered 5, answers to both should both be uploaded as question 5 on Crowmark.

## Reading

For Wednesday, September 6th, Chapter 1 of the *Big Book of Simulation Modeling*.

For Friday, September 8th, Chapter 1 of *Simulation*.

For Monday, September 11th, Sections 2.1 and 2.2 of *Simulation*, along with Sections 1.1 through 1.3 of *Probability Models*.

For Wednesday, September 13th, Section 2.3 of *Simulation*, along with Sections 1.4 through 1.6 of *Probability Models*. Have a quick look at Section 1.7 as well.

For Friday, September 15th, Section 2.4 of *Simulation*, along with Sections 2.1 through 2.3 of *Probability Models*.

For Monday, September 18th, Section 2.5 and 2.6 of *Simulation*, along with Sections 2.4 and 2.5 of *Probability Models*.

For Wednesday, September 20th, Sections 2.7 through 2.9 of *Simulation*, along with Section 2.7 of *Probability Models*.

This is fairly heavy reading, but you should have seen this material before in STAT 270. The sections in *Simulation* and *Probability Models* are covering the same topics, but *Simulation* assumes that you've seen it before, while *Probability Models* gives full details.

We will not cover Section 2.6 or 2.8 of *Probability Models*. For Section 2.7 (of both texts), you should understand the statements of the theorems and how to apply them, the proofs are tangential to our goals.

## Assignment exercises to hand in

Prediction markets offer opportunities to gamble on future events. For example, Polymarket takes bets on propositions like "Will Drake's album drop on 9/22?" (two days after the due date for this assignment). One can buy shares that cash for \$1 on the day of the outcome if correct, the cost of these shares (per dollar) arguably represent a probability of the event in question. (The Polymarket models the probability by aggregating the intuitions of its clients.)

1. Describe the sample space for:
  - (a) Will Drake's album drop on 9/22?
  - (b) The date on which Drake's (next) album drops.
2. As of this writing, the price of the "Yes" position on Drake's album is 75¢, thus suggesting a 75% chance that Drake's album will drop on September 22nd. [Background: Drake is a Canadian musician who sporadically releases ("drops") albums. He announced on September 6th that he plans to release his next album *For All the Dogs* on September 22nd. Previously Drake had announced that this album would be released on August 24th, but it did not happen at that time.]

Estimate the probabilities for the events described in question 1. For this question, you can use any source of information that you like, including personal opinion, but you should briefly explain your reasoning.

3. Describe one event which would *decrease* your estimate of the probability that Drake's album drops on 9/22. Explain why and give a revised probability estimate.
4. Describe one event which would *increase* your estimate of the probability that Drake's album drops on 9/22. Explain why and give a revised probability estimate.
5. Consider a traditional 6-sided fair die, with sides numbered 1 through 6.
  - (a) Compute the expected value of a roll of the die.
  - (b) Compute the variance of a roll of the die.
  - (c) Take an actual die and roll it 10 times, recording the results.
  - (d) Compare the average of the 10 rolls to the expected value from part (a). Does the average lie within one standard deviation of the expected value?
  - (e) Explain how you could simulate 10 rolls of a die using a random number generator which gives numbers uniformly at random on the interval  $[0, 1]$ .
  - (f) Give some details on how you could simulate 10 rolls of the die in AnyLogic.'

5. *Simulation*, Chapter 2, Exercise 1.
6. *Simulation*, Chapter 2, Exercise 2.
7. *Simulation*, Chapter 2, Exercise 6.
8. *Simulation*, Chapter 2, Exercise 9.
9. *Probability Models*, Chapter 1, Exercise 21.
10. *Probability Models*, Chapter 1, Exercise 31.
11. *Probability Models*, Chapter 1, Exercise 35.
12. *Probability Models*, Chapter 2, Exercise 13.
13. *Probability Models*, Chapter 2, Exercise 28.
14. *Probability Models*, Chapter 2, Exercise 43.

### Some other exercises you should try

This textbook has many worthwhile exercises, you are encouraged to try as many as you can. In *Probability Models* the starred exercises have solutions in the back of the book. These would be a good place to start.