Compound Events and the Additive Rule

1. Suppose you roll two dice. Describe the event "you get a 1 on at least one of the dice."

2. Compute the probability of the event in problem 1.

3. Suppose that two customers give ratings to the same restaurant on Yelp.

   (a) Express the event "the average of their ratings is 3.5 or 4" as a union of two other events.
       Hint: this is the same event as "the sum of their ratings is 7 or 8."

   (b) Suppose that both customers randomly assign their ratings with equal probability for all possible star ratings, so that all 25 sample points have equal probability. Compute the probability of the event in part (a).

Complementary Events and the Complement Rule

4. Suppose that 60% of NYU MBA students own iPhones. If you pick a random NYU MBA student, what is the probability that he or she will *not* own an iPhone?

5. Suppose you flip five coins. What is the probability of getting at least one head?
   Hint: what is the complement of this event?

Conditional Probability

6. Here is a table of the tabulated frequencies for the expected starting salary and gender for the respondents to the class survey.

Salary ($1K)	Gender		Total
	Female	Male	
$(0, 100]$	11	4	15
$(100, 125]$	5	7	12
$(125, \infty]$	5	15	20
Total	21	26	47

(a) Express the following statements as conditional probabilities:
   - $\frac{11}{21} \approx 52\%$ of the females listed a starting salary of $100K or lower.
   - $\frac{11}{15} \approx 73\%$ of those listing starting salaries of $100K or lower are female.

(b) Compute $P(\text{Male} \mid \text{Salary} > \$125\text{K})$ and $P(\text{Salary} > \$125\text{K} \mid \text{Male})$. Explain the difference between these two quantities.

7. The following table lists the pick-up and drop-off locations of approximately 170 million yellow cab taxi trips made in New York City in 2013. Numbers are reported in thousands.

| | Drop-off | | | | | |
Pick-up	Bronx	Brooklyn	Manhattan	Queens	Staten Is.	Total
Bronx	53	1	37	4	0	95
Brooklyn	8	2,707	1,598	273	2	4,588
Manhattan	638	5,458	143,656	5,906	22	155,680
Queens	122	1,022	5,058	2,281	8	8,491
Staten Is.	0	0	0	0	3	3
Total	821	9,188	150,349	8,464	35	168,857

(a) Find $P(\text{drop-off Brooklyn} \mid \text{pick-up Manhattan})$ and $P(\text{pick-up Manhattan} \mid \text{drop-off Brooklyn})$. Explain the difference between these two quantities.

(b) Express the following statement as a conditional probability: "29% of the trips with drop-off locations in Brooklyn originated in the same borough."

The Multiplicative Rule

8. Out of the 58 students enrolled in the class, 24 are female (41%) and 34 are male (59%). Suppose that we randomly select two different students.

   (a) What is the probability that both students are male?

   (b) What is the probability that both students are female?

   (c) What is the probability that one of the students is male and one of the students is female?

9. Of the 48 students who filled out the survey, 33 indicated that they drink at least one cup of coffee per day, while 15 indicated that they do not drink coffee on a typical day. Suppose that we randomly select two different survey respondents.

   (a) What is the probability that both students regularly drink coffee?

   (b) What is the probability that neither student regularly drinks coffee?

   (c) What is the probability that exactly one student regularly drinks coffee?