Probability
COR1-GB.1305 – Statistics and Data Analysis

Sample Points and Sample Spaces

1. In the following two experiments, what are the sample points and the sample space?
   (a) You flip a coin.

   (b) You roll a 6-sided die.

2. Suppose that a customer visits a restaurant and leaves a review on Yelp with 1–5 stars. What are the sample points and the sample space for the customer's star rating?

3. Suppose that two customers visit a restaurant, and that they both leave Yelp reviews with 1–5 stars each. What are the sample points and the sample space for the pair of star ratings?

4. Suppose you randomly pick a respondent from the class survey, then record their industry and gender. What are the sample points and the sample space? Assume that industry is either "Finance," "Manufacturing," or "Other."

Events

5. Suppose that a customer leaves a Yelp rating (1–5 stars) for a restaurant. Describe the event "the rating is odd (not even)."

6. Suppose you randomly pick a respondent from the class survey, then record their industry and gender. Assume that industry is listed as Finance, Manufacturing, or Other, and that gender is listed as Male or Female.
   (a) List the sample points in the event "the industry is Finance."

   (b) List the sample points in the event "the gender is Male."

Probability

7. Suppose you randomly pick a respondent from the class survey and record their industry and gender.

   (a) Use the following table of recorded survey response frequencies to compute the probabilities of the sample points.

	Gender		
Industry	Female	Male	Total
Finance	3	9	12
Manufacturing	2	4	6
Other	8	10	18
Total	13	23	36

   (b) Find the probability that the industry is Finance.

   (c) Find the probability that the gender is Male.

   (d) Find the probability the industry is Manufacturing.

8. Suppose that a customer's Yelp rating is random, and that the probabilities for the possible star ratings are $p_1 = 10\%$, $p_2 = 30\%$, $p_3 = 25\%$, $p_4 = 20\%$, $p_5 = 15\%$. Find the probability that the rating is odd.

Compound Events and the Additive Rule

9. Suppose you pick a random survey respondent and record their industry and gender.
   (a) List the sample points in the event "the industry is Finance or the gender is Male."

   (b) Compute the probability of the event in part (a) by adding the probabilities of all of the sample points in the event.

   (c) Express the event "the industry is Finance or the gender is Male" as a union of two other events.

   (d) Compute the probability of the event using the additive rule.

10. Suppose that two customers give ratings (1–5 stars) to the same restaurant on Yelp.
   (a) Express the event "at least one customer gives a 1 star rating" as a union of two other events.

   (b) Suppose that both customers randomly assign their ratings, giving equal probabilities to all possible star ratings. In this case, all 25 sample points have equal probability. Compute the probability of the event in part (a).

11. 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) As in problem 10(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

12. Here are the tabulated industry and gender frequencies from the class survey.

	Gender		
Industry	Female	Male	Total
Finance	3	9	12
Manufacturing	2	4	6
Other	8	10	18
Total	13	23	36

Use the data and the complement rule to answer the following questions:

(a) If you pick a random survey respondent, what is the probability that the industry will not be Finance?

(b) What proportion of survey respondents have an industry that is not listed as Other?

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