1. Determine if the following probability assignments are allowed. If not, explain why.
   (a) $P(A) = 0.5$, $P(B) = -0.1$, $P(A \cup B) = 0.4$.
   (b) $P(A) = 0.5$, $P(B) = 0.6$, $P(A \cap B) = 0$.
   (c) $P(A) = 0.5$, $P(B) = 0.6$, $P(A \cap B) \neq 0$.

2. *(from 2.8)* The proportions of blood genotypes, A, B, AB, and O in the population of all Caucasians in the US are approximately 0.41, 0.10, 0.04, and 0.45, respectively. A single Caucasian is chosen at random from the population, and their blood type recorded.
   (a) List the sample space for this experiment.
   (b) Assign probabilities to each of the simple events using the information given.
   (c) What is the probability that the person has either they A or type AB blood?

3. *(from 2.12)* A survey classified a large number of adults according to whether they were diagnosed as needing eyeglasses to correct their reading vision and whether they use eyeglasses when reading. The proportions falling into the four resulting categories are given in the table.

	Uses Glasses for Reading	
Needs Glasses	Yes	No
Yes	.44	.14
No	.02	.4

   A single adult is selected from the large group. Let N be the event that this adult needs glasses, and R be the event that this adult uses glass for reading.
   (a) Are N and R disjoint? Why or why not?
   (b) Find the probability that the adult needs glasses, $P(N)$.
   (c) Find the probability that the adult both needs glasses and uses them, $P(N \cap R)$.
   Find the following probabilities, and denote them using set notation, as in b and c.
   (d) Find the probability that the adult needs glasses, but does not use them.
   (e) Find the probability that the adult neither needs glasses nor uses them.

4. *(from 2.15)* Hydraulic landing assemblies coming from an aircraft rework facility are each inspected for defects. Historical records indicate that 8% have defects in shafts only, 6% have defects in bushings only, and 2% have defects in both shafts and bushings. One of the hydraulic assemblies is selected randomly. Use set notation to define the following events of interest, and calculate their probabilities. The assembly has
   (a) a bushing defect.
   (b) a shaft or bushing defect.
   (c) exactly one of the two types of defects.
   (d) neither type of defect.

5. **(2.22)** Three imported wines are to be ranked from lowest to highest by a purported wine expert. That is, one wine will be identified as best, another as second best, and the remaining wine as worst.
   (a) Describe one sample point for this experiment.
   (b) List the sample space.

(c) Assume that the "expert" really knows nothing about wine and randomly assigns ranks to the three wines. One of the wines is of much better quality than the others. What is the probability that the expert ranks the best wine no worse than second best?

6. **(2.30)** An upscale restaurant offers a special *fixe prix* menu in which, for a fixed dinner cost, a diner can select from four appetizers, three salads, four entrees, and five desserts. How many different dinners are available if a dinner consists of one appetizer, one salad, one entree, and one dessert?

7. **(2.34)** A personnel director for a corporation has hired ten new engineers. If three (distinctly different) positions are open at a Cleveland plant, in how many ways can she fill the positions?

8. **(2.35, 2.36)** A fleet of nine taxis is to be dispatched to three airports in such a way that three go to airport A, five go to airport B and one goes to airport C. Assume that the taxis are allocated to airports at random.

   (a) In how many distinct ways can this be accomplished?
   (b) If exactly one of the taxis is in need of repair, what is the probability that it is dispatched to airport C?
   (c) If exactly three of the taxis are in need of repair, what is the probability that every airport receives exactly one of the taxis requiring repair?

9. **(2.39)** Students attending the University of Florida can select from 130 major areas of study. A student's major is identified in the registrar's records with a two- or three-letter code (for example, STA for stats majors). Some students opt for a double major. The registrar was asked to consider assigning these double majors a distinct two- or three-letter code so that they could be identified through the student records' system.

   (a) What is the maximum number of possible double majors available?
   (b) If any two- or three-letter code is available to identify majors or double majors, how many major codes are available?
   (c) How many major codes are required to identify students how have either a single major or a double major?
   (d) Are there enough major codes available to identify all single and double majors at the University of Florida?

10. **(2.44)** A group of three undergraduate and five graduate students are available to fill certain student government posts. If four students are to be randomly selected from this group, find the possibility that exactly two undergraduates will be among the four chosen.

11. **(2.50, 2.51)** A balanced die is tossed six times and the number of the uppermost face is recorded each time. What is the probability that the numbers recorded are 1, 2, 3, 4, 5, and 6, in any order?

    Suppose the die has been altered so the faces are 1, 2, 3, 4, 5, and 5. If the die is tossed five times, what is the probability that the numbers recorded are 1, 2, 3, 4, and 5, in any order?

Most of these problems are taken directly from our text.