# ST 421/521 Fall 2020
Assignment #2

2.54 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 probability that exactly two undergraduates will be among the four chosen.

2.64 A balanced die is tossed six times, and the number on 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?

2.72 For a certain population of employees, the percentage passing or failing a job competency exam, listed according to sex, were as shown in the accompanying table. That is, of all the people taking the exam, 24% were in the male-pass category, 16% were in the male-fail category, and so forth. An employee is to be selected randomly from this population. Let A be the event that the employee scores a passing grade on the exam and let M be the event that a male is selected.

	Sex		
Outcome	Male (M)	Female (F)	Total
Pass (A)	24	36	60
Fail ($\overline{A}$)	16	24	40
Total	40	60	100

   a Are the events A and M independent?

   b Are the events $\overline{A}$ and F independent?

2.80 Suppose that $A \subset B$ and that $P(A) > 0$ and $P(B) > 0$. Are A and B independent? Prove your answer.

2.88 Suppose that A and B are two events such that $P(A) = .6$ and $P(B) = .3$.

   a Is it possible that $P(A \cap B) = .1$? Why or why not?

   b What is the smallest possible value for $P(A \cap B)$?

   c Is it possible that $P(A \cap B) = .7$? Why or why not?

   d What is the largest possible value for $P(A \cap B)$?

2.98 With relays operating as in Exercise 2.97, compare the probability of current flowing from a to b in the series system shown
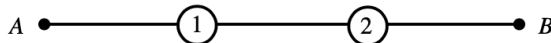
with the probability of flow in the parallel system shown.
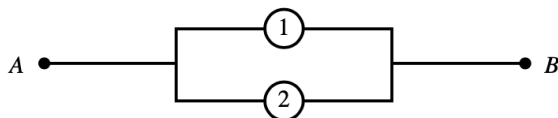
2.132   A plane is missing and is presumed to have equal probability of going down in any of three regions. If a plane is actually down in region i, let $1 - \alpha_i$ denote the probability that the plane will be found upon a search of the ith region, $i = 1, 2, 3$. What is the conditional probability that the plane is in

   a   region 1, given that the search of region 1 was unsuccessful?
   b   region 2, given that the search of region 1 was unsuccessful?
   c   region 3, given that the search of region 1 was unsuccessful?

3.4   Consider a system of water flowing through valves from A to B. (See the accompanying diagram.) Valves 1, 2, and 3 operate independently, and each correctly opens on signal with probability .8. Find the probability distribution for Y, the number of open paths from A to B after the signal is given. (Note that Y can take on the values 0, 1, and 2.)