

Reading: Devore §2.1–2.3

Problems from Devore (wording shortened in some cases without affecting meaning):

§2.1 # 1: Four universities—1, 2, 3, and 4— are participating in a holiday basketball tournament. In the first round, 1 will play 2 and 3 will play 4. Then the two winners will play for the championship and the two losers will also play. One possible outcome can be denoted by 1324 (1 beats 2 and 3 beats 4 in first-round games, and then 1 beats 3 and 2 beats 4).

- (a) List all outcomes in S
- (b) Let A denote the event that 1 wins the tournament. List outcomes in A .
- (c) Let B denote the event that 2 gets into the championship game. List outcomes in B .
- (d) What are the outcomes in $A \cup B$ and in $A \cap B$? What are the outcomes in A' ?

§2.1 # 7b: An academic department has just completed voting by secret ballot for a department head. The ballot box contains four slips with votes for candidate A and three slips with votes for B . Suppose the slips are removed from the box one by one, and a running tally is kept as slips are removed. List the outcomes for which A remains ahead of B throughout the tally.

§2.2, # 14: A utility company offers a lifeline rate to any household whose usage falls below 240 kWh. Let A denote the event that a randomly selected household does not exceed 240 kWh during January, and B be the analogous event for February. If $P(A) = 0.8$, $P(B) = 0.7$, and $P(A \cup B) = 0.9$, compute

- (a) $P(A \cap B)$
- (b) The probability that 240 kWh is exceeded in exactly one of the two months (and describe this event in terms of A and B).

§2.2, # 18: A box contains four 40-W bulbs, five 60-W bulbs, and six 75-W bulbs. If bulbs are selected one by one in random order (and not placed back into the box) what is the probability that at least two bulbs are selected to obtain one that is rated 75 W?

§2.2, # 25d: If 70% of car purchasers request A (automatic transmission), 80% request B (a sunroof), 75% request C (a CD player), 85% request A or B , 90% request A or C , 95% request B or C , and 98% request A or B or C , compute the probability that the next purchaser will select exactly one of the three options

§2.2, # 27ab: An academic department with five faculty members—Anderson, Box, Cox, Cramer, and Fisher—must select two members for a committee. Five slips of paper with their names on them are placed in a box and two are selected

- (a) What is the probability that both Anderson and Box will be selected?

(b) What is the probability that at least one of the two people whose name begins with C will be selected?

§2.3, # 30: A friend is giving a dinner party, and has 8 bottles of zinfandel, 10 of merlot, and 12 of cabernet.

(a) If he wants to serve 3 bottles of zinfandel and serving order is important, how many ways are there to do this?

(b) If 6 bottles of wine are to be randomly selected from the 30 for serving, how many ways are there to do this?

(c) If 6 are randomly selected, how many ways are there to obtain two bottles of each variety?

(d) If 6 are randomly selected, what is the probability that this results in two bottles of each variety being chosen?

(e) If 6 are randomly selected, what is the probability that all of them are the same variety?

§2.3, # 33: A company has 25 buses, and 8 of them have cracks.

(a) How many ways are there to select a sample of 5 buses from the 25 for an inspection?

(b) In how many ways can a sample of 5 buses contain exactly 4 with cracks?

(c) If a sample of 5 buses is chosen at random, what is the probability that exactly 4 of them will have cracks?

(d) If buses are selected as in (c), what is the probability that at least 4 will have cracks?

§2.3, # 40: Three molecules of type A, three of type B, three of type C, and three of type D are to be linked into a chain. One such chain is *ABCDABCDABCD* and another is *BCDDAAABDBCC*.

(a) How many such chain molecules are there?

(b) Suppose a chain of the type described is randomly selected. What is the probability that all three molecules of each type will end up next to one another (such as in *BBBAAADDCC*)?

§2.3, # 43: In five-card poker, a straight consists of five cards with adjacent denominations (e.g., 9 of clubs, 10 of hearts, jack of hearts, queen of spades, king of clubs). Assuming that aces can be high or low, if you are dealt 5 cards, what is the probability that it will be a straight with 10 as the high card? What is the probability that it will be a straight? What is the probability that it will be a straight flush (all cards in the same suit)?