# HW 3

Nicholas Alexeev

9/8/2021

**1. Devore§2.1 # 6.** A college library has five copies of a certain text on reserve. Twocopies (1 and 2) are first printings, and the other three (3, 4, and 5) are secondprintings. A student examines these books in random order, stopping only when asecond printing has been selected. One possible outcome is 5, and another is 213

a. List the outcomes in S.

b. Let A denote the event that exactly one book must be examined. What outcomesare in A?

c. Let B be the event that book 5 is the one selected. What outcomes are in B?

d. LetCbe the event that book 1 is not examined. What outcomes are in C?

**2. Devore§2.1 # 7.** An academic department has just completed voting by secret ballotfor a department head. The ballot box contains three slips with votes for candidateA and two slips with votes for candidate B. Suppose these slips are removed from thebox one by one.

a. List all possible outcomes

b. Suppose a running tally is kept as slips are removed. For what outcomes doesAremain ahead ofBthroughout the tally?

**3. Devore§2.2 # 14.** (p. 64) Suppose that 60% of all adults regularly consume coffee,45% regularly consume carbonated soda, and 80% regularly consume at least one ofthese two products.

a. What is the probability that a randomly selected adult regularly consumes bothcoffee and soda?

b. What is the probability that a randomly selected adult doesn't regularly consumeat least one of these two products?

**4. Devore§2.3 # 24.** Show that if one eventAis contained in another event B(i.e.,Ais a subset of B) then $P(A) \leq P(B)$. [Hint: For such A and B,A and $B \cap A'$ are disjoint (why??) and $B = A \cup (B \cap A')$ as can be seen from a Venn diagram.] For general A and B, what does this imply about the relationship among $P(A \cap B)$ ,$P(A)$ ,and $P(A \cup B)$

**5. Devore§2.3 # 31.** (p. 73) The composer Beethoven wrote 9 symphonies, 5 piano concertos (music for piano and orchestra) and 32 piano sonatas (music for solo piano).

a. How many ways are there to play first a Beethoven symphony and then aBeethoven piano concerto?

2

b. he manager of a radio station decides that on each successive night (7 daysper week), a Beethoven symphony will be played, followed by a Beethoven pianocon-

**6. Devore §2.3 # 36.** An academic department with five faculty members narrowed itschoice for department head to either candidate A or candidate B. Each member thenvoted on a slip of paper for one of the candidates. Suppose there are actually threevotes for A and two for B. If the slips are selected for tallying in random order, whatis the probability that A remains ahead of B throughout the vote count (e.g., thisevent occurs if the selected ordering is AABAB, but not for ABBAA)?

**7. Devore §2.3 # 39.** A box in a supply room contains 15 compact fluorescent lightbulbs,of which 5 are rated 13-watt, 6 are rated 18-watt, and 4 are rated 23-watt. Supposethat three of these bulbs are randomly selected

a. What is the probability that exactly two of selected bulbs are rated 23-watt?

b. What is the probability that all three of the bulbs have the same rating?

c. What is the probability that one bulb of each type is selected?

d. If bulbs are selected one by one until a 23-watt bulb is obtained, what is theprobability that it is necessary to examine at least 6 bulbs?

**8. Devore §2.3 # 43.** In five-card poker, a straight consists of five cards with adjacentdenominations (e.g., 9 of clubs, 10 of hearts, jack of hearts, queen of spades, and kingof clubs). Assuming that aces can be high or low, if you are dealt a five-card hand,what is the probability that it will be a straight with high card 10? What is theprobability that it will be a straight? What is the probability that it will be a straightflush (all cards in the same suit)?

**9.** Shade the Venn diagrams that are shown in the file "venn.pdf", which is posted onCanvas (under Files).

**10.**

a. In how many ways can 8 players be divided into teams of size 3 and 5? Explain.

b. In how many ways can 8 players be divided into teams of size 4 and 4? Explain.