Math 141 Week in Review
Week 6 Problem Set

Note: Not every topic is covered in this review. It is more heavily weighted towards Sections 6.4 & 7.1-7.3, since these are new. Please also look at the previous Week in Reviews for more practice from other sections.

1. An experiment consists of observing the outcomes when you toss a coin and then randomly select a marble from a jar with 3 red, 2 blue, and 5 green marbles.

A. What is the sample space for this experiment?
B. Describe the event E that a red marble is drawn.
C. Describe the event F that a tail is tossed or a green marble is drawn.
D. Are E and F mutually exclusive events?
E. Is this a uniform sample space? Why or why not?

2. A pair of fair dice is rolled. The sample space for this experiment is:

$S =$ {(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6),
(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6),
(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6),
(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6),
(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6),
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}

A. Is this a uniform sample space? Why or why not?
B. Calculate the probability that the product of the two numbers rolled is 6 or 8.
C. Calculate the probability that the product of the numbers is 4 or the sum of the numbers is 4.

3. A bag of Skittles contains 13 yellow, 11 green, 9 orange, 6 red, and 5 purple. You reach in and pull out one Skittle without looking. (We all know red are the best.)

A. What is the probability distribution for this experiment?
B. Calculate the probability of choosing a green or an orange.
C. Calculate the probability of not choosing a red.

4. Suppose $P(E) = 0.4$, $P(F) = 0.5$, and $P(E \cup F) = 0.6$. Calculate the following.

A. $P(E \cap F)$
B. $P(F^C)$
C. $P(E^C \cup F^C)$
D. $P(E^C \cap F)$

5. 500 people were surveyed about what recent movies they have seen. 264 of them have seen *Beverly Hills Chihuahua* while 175 of them had seen *Appaloosa*. 150 people have seen neither. What is the probability that a person selected at random from this group

A. has seen both?
B. has seen *Beverly Hills Chihuahua* but not *Appaloosa*?
C. has seen at least one of these two movies?
D. has not seen *Appaloosa*?

6. In the game of Rummikub, there are 52 tiles. The tiles are divided into four colored sets, each consisting of the numbers 1 through 13. The four colors are blue, black, red, and orange. Suppose that all the tiles are put into a bag and one tile is selected at random. Calculate the probability that

A. a red or black tile is selected.
B. a blue tile is not selected.
C. an orange tile or a 9 is selected.
D. neither a black tile nor a 12 is selected. (A black tile or a 12 is NOT selected.)

7. A chef has 20 different recipes that she wants to arrange in her recipe book. She has 9 dessert recipes, 6 entree recipes, and 5 appetizer recipes.

A. How many ways are there to arrange all 20 recipes in the book?
B. How many ways are there to arrange the recipes if she wants all the dessert recipes together, all the entree recipes together, and all the appetizer recipes together?

8. In a graduating class of 200 students, there will be one valedictorian, one salutatorian, and a group of 18 others will be in the top ten percent of the class. In how many different ways could the school have a valedictorian, salutatorian, and the rest of the top ten percent (assuming we know nothing about grades.)

9. A bag of marbles consists of 7 red, 9 green, and 10 yellow. Suppose a sample of 6 marbles is selected.

A. How many samples would contain exactly 4 reds?
B. How many samples would contain at least 3 green?
C. How many samples would contain no green marbles?
D. How many samples would contain exactly 3 yellow or exactly 2 red?

10. A grocery store stocker needs to stock a shelf with 7 identical cans of soup, 6 identical boxes of cereal, and 5 identical bottles of ketchup. He is in Math 141, so he starts rearranging all the items in a row in different ways. How many DIFFERENT arrangements are possible?

11. Let $U = \{a, b, c, d, e, f, g, h, i, j\}$, $A = \{a, d, h, j\}$, $B = \{b, e, f, i\}$, $C = \{e, h\}$, and $D = \{a, j\}$. Determine whether the following statements are True or False.

A. $D \subseteq A$
B. $C \subset B$
C. $g \in (A \cup B)$
D. $(A \cap B)^C = U$
E. $(B \cap C) \cup D = \varnothing$
F. $n((A \cup B)^C) = 2$
G. $n((D \cup C) \cap A) = 4$
H. C and D are disjoint sets.

12. A certain high school offers 3 AP exams: Calculus, U.S. History, and English. There are 185 students in the senior class. The information below describes how many seniors took these AP exams.

17 seniors took English and History, but not Calculus.
30 seniors took only Calculus.
41 seniors took Calculus and History.
43 seniors took exactly 2 AP exams.
127 seniors took Calculus or English.
84 seniors took History.
25 seniors took all three AP exams.

A. How many seniors did not take any of these AP exams?
B. How many seniors took exactly 1 AP exam?
C. How many seniors took Calculus or English, but not History?

13. How many 5-digit numbers are possible if the 1^{st}, 3^{rd}, and 5^{th} digits must be odd, the 2^{nd} and 4^{th} digits must be even, and there can be no repetitions?

14. Minimize $C = 2x + 4y$
Subject to:
$x + y \leq 10$
$x + 2y \geq 14$
$x \geq 2$

15. A sandwich shop makes peanut butter and jelly sandwiches in two sizes, small and large. Each small sandwich makes a profit of $2 and uses 3 ounces of peanut butter and 2 ounces of jelly. Each large sandwich makes a profit of $3 and uses 4 ounces of peanut butter and 4 ounces of jelly. The business only has 36 ounces of peanut butter and 32 ounces of jelly available to use each hour. How many of each size of sandwich should be sold each hour in order to maximize profit? Are there any leftovers?

16. A sporting event sells tickets for children, students, and adults. A child ticket sells for $10, a student ticket sells for $20, and an adult ticket sells for $25. The arena in which the sporting event is held holds 15000 people. The management wants to sell at least 4 times as many adult tickets as child tickets. Also, the money made from student tickets should be at most one-third of the money made from adult tickets. The last stipulation is that the number of adult tickets sold should be at least half the total number of tickets sold. How many child, student, and adult tickets should be sold in order to maximize revenue? Set up but do not solve the linear programming problem.