## 1 Week 7 HOGU: 4.1-4.4, Exam 2 Review

Problem 1. A student flips a coin three times, noting which side is up each time.
(a) Make a tree diagram that details each element in the sample space of this experiment.
(b) How many elements of the sample space have at least two heads being flipped?

Problem 2. A Math Learning Center tutor rolls two six-sided dice, one green and one blue, noting the side facing up when they land. The sample space for this experiment looks like this:

| 1 |  |  |  | 2 | 3 | 4 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 5 | 6 |  |  |  |  |  |
| 1 | $(1,1)$ | $(1,2)$ | $(1,3)$ | $(1,4)$ | $(1,5)$ | $(1,6)$ |
| 2 | $(2,1)$ | $(2,2)$ | $(2,3)$ | $(2,4)$ | $(2,5)$ | $(2,6)$ |
| 3 | $(3,1)$ | $(3,2)$ | $(3,3)$ | $(3,4)$ | $(3,5)$ | $(3,6)$ |
| 4 | $(4,1)$ | $(4,2)$ | $(4,3)$ | $(4,4)$ | $(4,5)$ | $(4,6)$ |
| 5 | $(5,1)$ | $(5,2)$ | $(5,3)$ | $(5,4)$ | $(5,5)$ | $(5,6)$ |
| 6 | $(6,1)$ | $(6,2)$ | $(6,3)$ | $(6,4)$ | $(6,5)$ | $(6,6)$ |

Let $E$ be the event "the sum of the two dice is even". Let $F$ be the event "a 4 is rolled on the blue die". Let $G$ be the event "the green die shows a number greater than $7^{\prime \prime}$.
(a) How many outcomes are there in $G^{C}$ ?
(b) Verbally describe the outcomes in the event $E \cap F$.
(c) List the outcomes in $E \cap F$.

Problem 3. Shade in the given set in each Venn diagram.
(a) $A \cup B^{C}$

(b) $A \cap B$, where $A$ and $B$ are mutually exclusive


Problem 4. Let $A$ and $B$ be two events such that $P(A)=0.4, P(B)=0.3$, and $P(A \cup B)=0.5$. Find $P(A \cap B)$.

Problem 5. Let $A$ and $B$ be two events such that $P\left(A^{C}\right)=0.3, P\left(B^{C}\right)=0.4$, and $P(A \cap B)=0.5$. Find $P\left(A^{C} \cap B^{C}\right)$.

Problem 6. A fair standard four-sided die is rolled, noting the number shown. At the same, time a spinner divided into 4 equal regions - red, green, blue, and yellow - is spun, noting the color. What is the probability that the die shows a 2 OR the spinner lands on blue?
(Hint: is there a type of diagram that is useful to draw when given this type of experiment?)

Problem 7. The probability distribution given below is missing a value:

| $X$ | 1 | 2 | 3 | 4 | 5 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $P(X)$ | $\frac{1}{20}$ | $\frac{3}{20}$ | $\frac{5}{20}$ | $\frac{4}{20}$ |  |

(a) Compute the missing value in the distribution.
(b) Calculate $P(X>2)$.
(c) We say the expected value of a random variable $X$ is found by multiplying each value the random variable $X$ can be with its corresponding probability and then adding the results. For example, in the distribution

| $X$ | 0 | 1 |
| :---: | :---: | :---: |
| $P(X)$ | 0.4 | 0.6 |

the expected value of $X$ is $0 * 0.4+1 * 0.6=0.6$. Find the expected value of the random variable $X$ in the first distribution table above.

Problem 8. A veterinary network records the number of households with only a single pet in each of the Houston, Austin, and BCS regions. Out of 300 total households, the network provides the following data:

|  | Cats | Dogs | Parrots |
| :---: | :---: | :---: | :---: |
| Houston | 75 | 35 | 10 |
| Austin | 40 | 40 | 20 |
| BCS | 30 | 45 | 5 |

A travelling salesman picks one of these households at random to visit. What is the probability that the salesman visits a Houston household that does not own a parrot?

Problem 9. Set up, but do not solve, the following linear programming problem.

You have at most $\$ 24,000$ to invest in bonds and stocks. You have decided that the amount of money invested in bonds must be at least twice as much as that in stocks, but the money invested in bonds must not be greater than $\$ 18,000$. If you receive $6 \%$ profit on bonds and $8 \%$ profit on stocks, how much money should you place in each type of investment to maximize your profit?

## Variables:

Maximize/Minimize (circle one):

## Subject to:

Problem 10. Consider the following solution set for a system of inequalities:


The objective function is $P=7 x+6 y$.
Does this objective function have a maximum in this solution set?

Does this objective function have a minimum in this solution set?

Find the maximum and minimum, whichever exist, of this objective function in this solution set using the Method of Corners.

Problem 11. Consider the following solution set for a system of inequalities:


The objective function for this system is $P=4 x+5 y$.
Does this objective function have a maximum in this solution set?

Does this objective function have a minimum in this solution set?

Find the maximum and minimum, whichever exist, of this objective function in this solution set using the Method of Corners.

