

# 2024 Fall Math 140 Week-In-Review

## Week 7: Sections 4.2 and 4.4

**Some Key Words and Terms:** Sample Space, Uniform, Event, Probability, Probability Distribution, Union Rule, Complement Rule, Venn Diagram, Random Variable, Histogram, Expected Value, Fair Game.

Sample Space:

Uniform:

Event:

Probability:

Probability Distribution:

Union Rule:

Complement Rule:

Venn Diagram:

Random Variable:

Histogram:

Expected Value:

Fair Game:

Examples:

1. For the following experiments, write the sample space and determine if the sample space is uniform or not.
  - (a) Flipping a fair coin recording a result of heads or tails.
  - (b) Rolling a fair 6-sided die and recording the number rolled.
  - (c) Rolling a fair 10-sided die and recording a result of 1-6 as "A" and a result of 7-10 as "B".
  - (d) Drawing a card from a well-shuffled standard 52 card deck and recording the suit of the card.
  - (e) Spinning a spinner with three equal regions that are blue, green, and orange, and recording the color the spinner lands on.
  - (f) Drawing a card from a well-shuffled standard 52 card deck and recording an Ace as a "1" and any other card as a "2".
  - (g) Rolling a fair 9-sided die and recording an even or odd result.

2. An experiment involves rolling a fair 6-sided die and a fair 4-sided and recording the result of each die.
- (a) Construct a dice chart representing this experiment.
  
  
  
  
  
  
  
  
  
  
  - (b) Determine the probability of rolling 4 on at least on die.
  
  
  
  
  
  
  
  
  
  
  - (c) Determine the probability of rolling a double.
  
  
  
  
  
  
  
  
  
  
  - (d) Determine the probability of rolling an odd number on the 4-sided die or a 6 on the 6-sided die.

3. A survey is conducted asking respondents which social media platform they use the most between Facebook, Snapchat, and Instagram. The table below shows the results.

|          | Facebook | Snapchat | Instagram |
|----------|----------|----------|-----------|
| Under 30 | 21       | 46       | 43        |
| 31 to 50 | 46       | 41       | 58        |
| Over 50  | 27       | 8        | 13        |

- (a) Determine the probability that a respondent is not over 50.
- (b) Determine the probability that a respondent is a person under 30 and uses Facebook.
- (c) Determine the probability that a respondent uses Instagram or is 31 to 50 years of age.
- (d) Determine the probability that a respondent is under 30 and uses Snapchat, or is over 50 and uses Facebook.

4. Given the following probability distribution, answer the following.

|             |      |      |      |   |      |      |
|-------------|------|------|------|---|------|------|
| Outcome     | A    | B    | C    | D | E    | F    |
| Probability | 0.17 | 0.22 | 0.08 |   | 0.31 | 0.11 |

Let  $X$  be the event A, C, or E occurs; let  $Y$  be the event that A, B, or C occurs; and let  $Z$  be the event that B or F occurs.

5. Determine  $P(Z^C)$

6. Determine  $P(X^C \cup Z)$

7. Determine  $P((X \cup Y)^C \cap Z)$

8. A survey is conducted where students that live off-campus were asked if they drive to class or take the bus to class. Out of a survey of 500 students, 228 indicated that they drive to class and 315 indicated that they take the bus to class. Out of the 500 respondents, 92 indicated that they neither drive nor take the bus to class.

(a) Construct a Venn Diagram representing the results of the survey.

(b) Determine the probability that a randomly selected student rides the bus to class and drives to class.

(c) Determine the probability that a randomly selected student rides the bus to class but does not drive to class.

9. An experiment consists of rolling a fair 4-sided die two times in a row and recording the result of each roll.

(a) Construct a probability distribution for the random variable  $X$  representing the number of 2's rolled.

(b) Determine  $P(X = 0)$

(c) Determine  $P(X \geq 1)$



10. The table below shows the probability distribution for a random variable  $X$ . Determine the expected value of  $X$ .

|      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|
| X    | 1    | 2    | 3    | 4    | 5    | 6    |
| P(X) | 0.17 | 0.22 | 0.08 | 0.11 | 0.31 | 0.11 |

11. A company sells an advanced nano-machine for \$50,000 and offers a protection plan for the machine that costs an additional \$2,500. If the machine explodes, the company will pay back the full cost of the machine plus another \$10,000 in damages. If the machine short-circuits, the company will pay back 75% of the cost of the machine. If the machine "get cranky", the company will pay back 25% of the cost of the machine. There is a 0.5% chance the machine will explode, a 2% chance the machine will short-circuit, and an 5% chance the machine will "get cranky". How much profit can the company expect to make off the protection plans?

12. The net winnings for the player in a new card game are given by the probability distribution given below. Is the game fair? Explain how you know.

|      |      |      |      |      |      |     |
|------|------|------|------|------|------|-----|
| X    | -\$6 | -\$2 | \$0  | \$2  | \$3  | \$4 |
| P(X) | 0.1  | 0.25 | 0.25 | 0.15 | 0.15 | 0.1 |

**Don't forget: Chapter 3 is on Exam 2!**

The Method of Corners (3.1-3.3)

The Simplex Method (3.4)