Math 212 **Exam 1** **Mar. 5, 2021**

Name: _____

Instructions: This exam has 5 questions for a total of 51 points. Answer each question as completely and clearly as you can. Make sure to use complete sentences. Take care to not oversimplify any problems. You have 50 minutes.

Question	Points	Score
1	10	
2	15	
3	8	
4	10	
5	8	
Total:	51	

(10 points) 1. Some hungry students head to the Healthy Snack Shop where they can choose one of five kinds of fruit, one of three herbal teas, and one of six flavors of wraps to get packed in a box. How many possible snack boxes are there?

(15 points) 2. One college sent another a report saying that 119 students took Calculus I in a Fall semester. The report notes that during the next term, 96 of these studnets took Calculus II, 53 took Discrete Mathematics, and 39 took Physics II. The report says that 48 of the students took Calculus II and Discrete Mathematics, 31 of the students took both Discrete Mathematics and Physics II, 32 of the students took both Calculus II and Physics II, and 22 of the students took all three courses. We examine the report and sense an error is present. Why?

(8 points) 3. Let $f : \{1, 2, 3, 4, 5\} \to \{a, b, c, d\}$ be a function. Justify your answers to the following questions.

(a) How many such functions f exist?

(b) How many such functions are injective?

(c) How many such functions are surjective?

(d) How many such functions are bijective?

(10 points) 4. Let $S = \{a, b, c, d\}$, $T = \{1, 2, 3\}$, and $U = \{b, 2\}$. Which of the following statements is true? Which is false? Explain.

(a) $\{a\} \in S$

(b) $\{a, c, 2, 3\} \subseteq S \cup T$

(c) $U \in \mathcal{P}(S \cup T)$

(d) $\emptyset \subseteq \mathcal{P}(S)$

(e) $\{\emptyset\} \subseteq \mathcal{P}(S)$

(8 points) 5. Dr. Janssen wishes to distribute 10 Rubik's cubes to the 19 students in Math 212. **In answering the following questions, you only need to give an expression that evaluates to the correct answer; the actual number is not required for full credit.**

(a) Suppose first that the cubes are identical, so it would be silly to give anyone more than one cube. How many ways are there to accomplish this?

(b) Now suppose each cube is a different model, so that it's not unreasonable to give more than one cube to a particular person. Still, we'll ensure that no one gets more than three cubes. How many ways are there to accomplish this?