Q1 Independence
2 Points
Suppose we roll two N-sided die yielding values $D_1, D_2$. Let event $E$: $D_1 = 1$, event $F$: $D_2 = N$. event $G$: $D_1 + D_2 = k$. Suppose we know $E$, $F$, and $G$ are pairwise independent (i.e., $E$ and $F$ are independent; $F$ and $G$ are independent and $E$ and $G$ are independent. Suppose further that $E$, $F$, and $G$ are not three-way independent. What is $k$?

- $N$
- $7$
- $N + 1$
- $2N$
- $1$
- $10$
- $N^2$

Q2 Principle of Inclusion and Exclusion
1 Point
Define: Principle of Inclusion and Exclusion for two events, $E$ and $F$. Note that these events are not necessarily independent.

- $P(E \cup F) = P(E) + P(F) - P(E \cap F)$
- $P(E \cup F) = P(E)P(F)$
- $P(E \cup F) = P(E) + P(F)$

Q3 Chain Rule
2 Points
Let $E$, $F$, and $G$ be events with nonzero probabilities.

Q3.1
1 Point
What is an equivalent expression for $P(EGF)$?

- $P(F|EG)P(G|EF)P(E|FG)$
- $P(F|E)P(G|E)P(E|FG)$
- $P(F)P(G|F)P(E|FG)$
- $P(F)P(G)P(E|FG)$
- $P(E)P(F)P(G)$

Q3.2
1 Point
Suppose that $F$ and $G$ are independent. Using the property of independence, what is an equivalent expression for $P(EGF)$?

- $P(F|EG)P(G|EF)P(E|FG)$
- $P(F|E)P(G|E)P(E|FG)$
- $P(F)P(G|F)P(E|FG)$
- $P(F)P(G)P(E|FG)$
- $P(E)P(F)P(G)$