Please write **Your name:** _____

You may leave your answer in terms of sums, products, factorials or binomial coefficients, and fractions. There is NO need to simplify. NO calculators are needed.

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(1) There are 52 cards in a standard deck of playing cards. There are 4 *suits*: hearts, spades, diamonds, and clubs ($\heartsuit \spadesuit \diamondsuit \clubsuit$). Hearts and diamonds are red while spades and clubs are black. In each suit there are 13 *ranks*: the numbers $2, 3 \ldots, 10$, the three face cards, Jack, Queen, King, and the Ace. Note that Ace is not a face card. Suppose we choose two cards at random, one after another without replacement. Let $A = \{$the first card is a King$\}$, $B = \{$the second card is a King$\}$. Are these events independent or not? Explain.

(2) Two dice are simultaneously rolled. Let $A = \{$the sum is 7$\}$, $B = \{$the first die lands a 5$\}$. Are these events independent or not? Explain.

(3) You make successive independent flips of a coin that lands on heads with probability $\frac{1}{2}$. What is the probability that the 4th head appears on the 8th flip?

(More on the back)

(4) Suppose we choose 2 balls at random, one after another without replacement, from a box containing 3 red and 3 blue balls. Event A is that the first ball is red. Event B is that the second ball is blue. Are events A and B independent? Explain.

(5) On a fictional planet, the year is 300 days long. Every day there maybe rain, or snow, or both, or neither. In a given year, there are 150 days of rain, 150 days of snow, and 100 days of neither. What is the number of days when there is rain and snow?

(6) On the same planet, on a random day, are rain and snow independent? Explain.