1. A flips a fair coin once. B flips a fair coin twice. Describe a reasonable probability space and assign probabilities to the elementary events. What is the probability that A sees more heads than B?

2. Ten cards bear the labels 1, 2, ..., 10. You shuffle them and then select three in the order $C_1, C_2, C_3$ from the top of the deck. What is the probability that the labels on $C_1, C_2, C_3$ appear in increasing order?

3. Show that for any collection of events $A_1, A_2, \ldots, A_n$,

$$P(A_1 \cap A_2 \cap \ldots \cap A_n) = P(A_1) \cdot P(A_2|A_1) \cdot P(A_3|A_1 \cap A_2) \cdot \ldots \cdot P(A_n|A_1 \cap \ldots \cap A_{n-1}).$$

4. Disease $X$ affects 1% of the general population. A medical test, when applied to a person with the disease, accurately detects the disease in nine cases out of ten. When applied to a person without the disease, it accurately reports no disease in 96 out of 100 cases. If person $A$ tests positive for the disease, what is the probability that he actually has it?