**Sample Problems:**

1. A random experiment of rolling a 6-sided die twice.

   (a) Let A be the event of getting same number on both rolls, B the event that the rolls add up to 4, and C the event that the rolls add up to 2. Compute

   i. $P(A^c)$
   ii. $P(A \cap B)$
   iii. $P(A \cup B)$
   iv. $P(B \cap C)$

   $\frac{5}{6}$, $\frac{1}{36}$, $\frac{2}{9}$, 0

   (b) Find the conditional probability of $B$ given $A$.

   $\frac{1}{6}$

2. A thief steals an ATM card and randomly guesses the correct PIN code that consists of 4 digits (0-9).

   (a) What is the probability of guessing correctly on the first try?

   1/10000

   (b) If the thief knows that all 4 digits are different numbers, what is the probability?

   1/5040

   210

3. A disease is present in 5 out of 100 people, and a test that is 90% accurate (true positive 90%, false positive 10%) is administered to 100 people. If one person in the group tests positive, what is the probability that this one person has the disease?

   $D$: a given person has the disease $P(D) = 0.05$, $T$: The test shows positive $P(T|D) = 0.90$, $P(T|D^c) = 0.10$,
   $P(D|T) = \frac{P(T|D)P(D)}{P(T|D)P(D)+P(T|D^c)P(D^c)} = 32.14\%$