Infinity and Random Variables

1. Recall the experiment from Lecture 4 which was as follows.

   1. We flip three coins.
   2. If all three coins are different, we record the occurrence of events as follows: 1st event for the sequence (T, H, H), 2nd event for (H, T, H), 3rd event for (H, H, T), 4th event for (H, T, T), 5th event for (T, H, T) and 6th event for (T, T, H).
   3. All three coins are the same, then we go back to step 1 and continue!

   Calculate the probability of getting the result (T, H, H) using the limit law for probability.

2. We repeated roll a pair of dice until the sum is *not* 7. Find the probability of each possible sum (from 2 to 12).

3. Given a real-valued random variable X, what is the relation between $P(X \leq 0)$ and the probabilities $P(X \leq 1/n)$ for all positive integer values of n. Is there anything special about 0 in this example?

4. Given a real-valued random variable X what is the relation between $P(X \leq 0$ and the probabilities $P(X \leq -1/n)$ for all positive integer values of n. Is there anything special about 0 in this example?

5. In a repeatable experiment Σ there are events A and B which can be observed. Assume that $P(B) > 0$. We now carry out Σ repeatedly until B is observed. What is the probability that A is also observed at the same time as B?

6. We know that 40% of the fish in a pond are female. We repeatedly catch and release fish until we find one that is female; in that case we record its species before releasing it. After 100 such recordings we find that 20 of these females were pomfret fish. What is a reasonable estimate of the percentage of female pomfret in the pond? Can we conclude the 20% of the fish are pomfret?