CS/EE 144

Probability refresher

1 Boys and girls

(a) Professor Wierman has two children. It is known that at least one of them is a boy. What is the probability that both children are boys?

(b) Professor Wierman has two children. If you see him walking with one of his children and that child is a boy, what is the probability that both children are boys?

2 Unfair coin

You are given 1000 coins. Among them, 1 coin has heads on both sides. The other 999 coins are fair coins. You randomly choose a coin and toss it 10 times. Each time, the coin turns up heads. What is the probability that the coin you choose is the unfair one?

3 Tossing until head

A biased coin has a probability p of showing heads when tossed. The coin is tossed repeatedly until a head occurs. What is the expected number of tosses required to obtain a head?

4 Balls and boxes

A total of r balls are placed, one at a time, into k boxes. Each ball is placed independently into box i with probability p_i (with $\sum_{i=1}^{r} p_i = 1$).

(a) What is the expected number of empty boxes?

(b) What is the expected number of boxes containing at least 2 balls?

5 Coupon collection

There are N distinct types of coupons in cereal boxes and each type, in dependent of prior selections, is equally likely to be in a box. If a child wants to collect a complete set of coupons with at least one of each type, how many coupons (boxes) on average are needed to make such a complete set?