EE 131A
 Probability
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Discussion Set 2
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1. Two riflemen A and B are shooting at a target. Independently of who is shooting, the probability that the shot results in a hit is 0.5. Each shot is independent from others, and the riflemen shoot at the target one by one in the order A, B, A, B, ... What is the probability that A hits the target before B?

2. *Conditional Probability.* Problem 2.73, page 88 of ALG.

   (a) Find $P(A|B)$ if $A \cap B = \varnothing$; if $A \subset B$; if $A \supset B$.

   (b) Show that if $P(A|B) > P(A)$, then $P(B|A) > P(B)$.

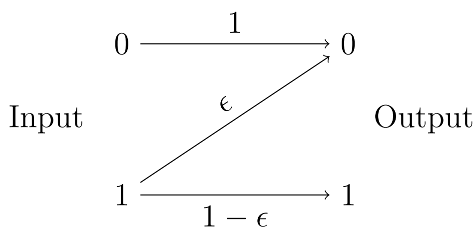
3. *The Number of Children.* A family has j children with probability p_j, where $p_1 = .1$, $p_2 = .25$, $p_3 = .35$, $p_4 = .3$. A child from this family is randomly chosen. Given that this child is the eldest child in the family, find the conditional probability that the family has

   (a) only 1 child;

   (b) 4 children.

4. *Pairwise independence and overall independence.* Alice, Bob and Claire each throw a fair die once. Show that the events A, B and C where A: "Alice and Bob roll the same face", B: "Alice and Claire roll the same face" and C: "Bob and Claire roll the same face" are pairwise independent but not independent.

5. A binary Z-channel is show in the figure. Assume the input is “0” with probability p and “1” with probability $1 - p$.



(a) What can you say about the input bit if “1” is received?

(b) Find the the probability that the input was “1” given that the output is “0”.