1). In a predation experiment, 5 different prey items are in arena. A predator consumes two items, one after the other. How many outcomes in
   a). the sample space?
   b). the event that the first prey item consumed is # 4?
   c). the event that the second prey item consumed is # 4?
   d). the even that the first or the second prey item is #4?
   e). the event that prey item # 4 is not consumed?

2). The binoculars of four ornithologists (A, B, C, and D) get mixed up in a bag when running away from a charging rhino. After they escape, binoculars are passed out at random upon hearing a Blue-throated Barbet. Find the probability that
   a). C gets her own binoculars
   b). A and D get their own binoculars
   c). B, C and D get their own binoculars

before they are all trampled or gored because they were only paying attention to birds.

3). Let $\Omega$ be the set of points with positive integer coordinates: $\omega = (i, j)$, and define a probability distribution by $p(\omega) = 1/2^{i+j}$.
   a). Show that $\sum p(\omega) = 1$.
   b). Find the probability of the event $\{(i, j) : i + j \leq 4\}$

4). One day you meet Smith, who has two children, on the street with his son. What is the probability that Smith’s other child is also a boy? One line of reasoning is the following. If the sexes of the children are determined independently and with equal probability, the probability that the second child is a son is 1/2. Alternatively, one could argue that of the four possible outcomes \{BB, BG, GB, GG\}, GG has been eliminated because you’ve already met one son, which means that if each family combination is equally likely, the probability that the second son is a boy is 1/3. Which line of reasoning is correct and why? Formulate your argument with probability statements.

5). $(X, Y)$ has the bivariate CDF $F(x, y) = \frac{1}{2}(x^2y + xy^2)$ on the unit square: $0 < x < 1, 0 < y < 1$.
   a). Show that the unit square has probability 1.
   b). What is the corresponding p.d.f?
   c). What is $F(x)$ for $0 < x < 1$ and $y > 1$?
   d). What are the marginal distributions of $X$ and $Y$?
   e). What is $P(X + Y < 1)$?

6). The joint p.d.f of $(X, Y)$ is $f(x, y) = 6(1 - x - y)$ for $0 < y < 1 - x$ and $0 < x < 1$. Find the conditional p.d.f.’s $f(x|y)$ and $f(y|x)$.