1. If 15 children are selected at random from a group of 10 boys and 10 girls, what is the probability that at most 7 boys will be selected?

2. Consider Polya's Urn Scheme as described in the class (starting with b black balls and r red balls, and adding c balls at each stage). Define, as in the class, R_i to be the event that the i^{th} draw yields a red ball. Calculate the following probabilities with full justification:

- 1. $P(R_3)$.
- 2. $P(R_3|R_2)$.
- 3. $P(R_2|R_3)$.
- 4. P(in the first 4 draws, exactly 2 red balls are obtained).

3. Raveena has n keys, of which exactly one will open her door. If she tries the keys at random, discarding those that do not work, what is the probability that she will open the door on her k^{th} try? What if she does not discard previously tried keys?

4. Suppose an urn has 5 red balls, 4 black balls and 6 green balls. If balls are chosen at random with replacement from this urn, compute the probability that at least 7 draws are needed to see balls of all colours. [Hint: Consider the event "no red ball is obtained until the 6^{th} draw" and so on. Use inclusion-exclusion principle.]

5. Shyam is randomly selected from the citizens of Hyderabad by the Health authorities. A laboratory test on his blood sample tells Shyam that he has tested positive for Swine Flu. It is found that 95% of people with Swine Flu test positive but 2% of people without the disease will also test positive. Suppose that 1% of the population has the disease. What is the probability that Shyam indeed has the Swine Flu ?

1. Suppose there is an urn that contains r red balls and b black balls. A ball is drawn at random and its colour noted. It is replaced with c > 0 balls of the same colour. The procedure is then repeated. For $j = 1, 2, ..., \text{ let } R_j$ be the event that the *j*-th ball drawn is red. What is $P(R_2)$?