Introduction to Probability Theory I

Exercise 3, Autumn 2008

1* An urn contains 15 balls. Five of those are white and the rest black. We pick 10 balls without replacement. Find the probability that we pick
a) at least one white ball;
b) all five of the white balls.

2. Johanna and Leena and eight other people form a queue in random order. Determine the probability that at most two people are between the girls.

3. Set E has N elements. We pick a sample of n elements. Find the probability that an element a is in the sample when sample is chosen
a) without replacement,
b) with replacement.

4* A 1500 meter race has 36 competitors. They are randomly divided to three heats, 12 runners in each heat. Find the probability that Finnish Aalto and Kenyan Korir are in same heat.

5. Group consists of $2n$ boys and $2n$ girls. It is divided into to groups of $2n$ children. Find the probability that both groups have equally many boys and girl and approximate this probability using Stirling's formula.

6. We place N balls, that nunbered from 1 to N, in an urn. We pick n ball from this urn. Find the probability that the largest picked number is k, when we pick the sample
a) with replacement,
b) without replacement.
(Hint: consider events B_k="largest number is less or equal to k").