

Bus 273: Statistical Analysis for Business

Fall 2014

PROBLEM SHEET # 6

Problem 1: An urn contains 9 balls, 6 are white and 3 are black. Two balls are randomly drawn. Find the probability that both are white, when:

- the balls are drawn without replacement,
- the balls are drawn with replacement.
- Give an example of a business-related application of an urn model.

Problem 2: Rolling a die. Consider the events $A = \{1, 3, 5\}$ and $B = \{1, 2, 3, 4\}$.

- Show that A and B are independent if the die is fair.
- Show that A and B need not be independent if the die is biased.

(This problem shows that the independence of events is a *probabilistic* property.)

Problem 3: In the following problem, assume that a year has 365 days, and that people's birthdays are independent and uniformly distributed over the year.

- Compute the probability that at least two of the 11 players of a football team have the same birthday. (Hint: First compute the probability that all 11 players have a different birthday.)
- How many people will at least have to get together in order to have a 50:50 chance that at least two of them have the same birthday?
- Compute the probability that at least two students in a class of 50 have the same birthday.

(These and similar problems are known as the *birthday problem*.)