Humboldt-Universität zu Berlin
Institut für Physik

Winter Semester 2010/2011
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Statistical Methods of Data Analysis
Problem Set #1

Due Date: Thursday, October 28, 2010, during the lecture

Problem 1: (6 points)

We consider a non-empty set of events Ω with a corresponding probability distribution P. Prove the following relations:

i) $P(B \backslash A) = P(B) - P(A \cap B)$

ii) $A, B \subset \Omega \Rightarrow P(B \cup A) = P(A) + P(B) - P(A \cap B)$

iii) $A, B \subset \Omega, A \subset B \Rightarrow P(A) \leq P(B)$

Problem 2: (5 points)

A player randomly picks a card from an ordinary deck of 52 playing cards.

i) What is the probability of getting a face card (i.e. a jack, a queen or a king) or a club?

ii) What is the probability of getting a club face card?

Problem 3: (10 points)

From a survey of high school students we learn that in their spare time: 10% of the students play music, 20% do sport, 5% study a foreign language. In addition, 5% of the students play music and do sport, 3% play music and study a foreign language, 2% do sport and study a foreign language. Lastly, 1% of them do all the activities.

i) Name the subsets and draw an approximate Venn diagram.

ii) If you randomly pick a student, what is the probability of getting one who does sport?

iii) What is the probability of getting one who plays music and studies a language but does no sport?

Problem 4: (10 points)

You buy from a vendor 10000 seeds, convinced that they are those with a probability of 80% to sprout. But after some time you get 7000 plants. You suspect that the vendor had mixed the high quality seeds with a cheaper type that has a probability of only 40% to sprout.

i) Can you tell the fraction of cheap seeds out of the total that you were sold?

ii) Can you tell how many of the 7000 plants come from the high-quality seeds?