Problem Sheet

1. A spare parts dealer buys large components from a manufacturer in batches of size 50. He has an agreement with the manufacturer that on arrival a sample of 5 parts will be selected from the batch and inspected. If the sample contains 2 or more defective components the whole batch will be returned and a new batch supplied.

If a batch contains 10 defective components what is the probability that it will be returned?

If a batch contains 20 defective components what is the probability that it will be accepted?

2. A bookie offers a bet on the outcome of the Lotto as follows: the customer is required to select 4 numbers. If those 4 numbers are among the 6 numbers randomly selected by the Lotto then the customer wins. If the bookie offers odds of 5000:1, has she correctly assessed the probabilities involved? Take the case of 42 numbers from which 6 are selected.

3. A hand of thirteen cards is dealt from a pack of 52. What is the probability that it contains 5 spades, 4 hearts, 3 diamonds and 1 club? (Hint: generalise from the Hypergeometric distribution.)

4. An international team of twenty swimmers is suspected to contain some who use performance enhancing drugs. For diplomatic reasons not all the team members can be tested. Explain how you would decide on a minimum number of tests such that there will be a probability of at least 0.95 of detecting at least one 'druggie', if there are five or more in the team.

5. A student has to sit an examination paper which will contain five questions, all of which must be answered. He decides that there really are only ten topics on which he might be examined and decides he will only study X topics. Explain how to decide on a value of X such that he will have a probability of at least 0.85 of being able to attempt at least four of the five questions.