

## *Example sheet 1*

Due April 17, after the lecture

### **Problem 1**

[to be submitted]

In a shop there are  $k$  kinds of postcards. We want to send postcards to  $n$  friends. How many different ways can this be done (each friend should get exactly one postcard)? What happens if we want to send them different cards? What happens if we want to send two different cards to each of them (but different persons may get the same card)?

### **Problem 2**

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- (a) How many possibilities are there to distribute  $k$  euros among  $n$  people so that each receives at least one?
- (b) Suppose we do not insist that each person receives something. What will be the number of distributions in this case?

### **Problem 3**

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How many anagrams can be formed from the word CHARACTERIZATION? (An anagram is a word having the same letters, each occurring the same number of times; this second word does not need to have a meaning.)

### **Problem 4**

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Show the following:

1.  $\sum_{\ell=0}^k \binom{n}{\ell} \binom{m}{k-\ell} = \binom{m+n}{k}$
2.  $\binom{n}{k-1} \leq \binom{n}{k}$  for  $2k \leq n+1$

### **Problem 5**

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A chessboard  $B$  of size  $2^n \times 2^n$  is given where one arbitrary field is cut out. Show that one can perfectly tile the remaining fields by dominos of the form “L”:  $(1, 1)$ ,  $(1, 2)$ ,  $(2, 1)$  (you can rotate dominos).