

## BASIC PROBABILITY: THEORY

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# Practice problem set 1

This week's exercises deal with sets, counting and uniform probabilities. You do not have to hand these exercises in; they are optional and for practicing only. If you have questions about them, please post them to the [discussion forum](#) and try to help each other. We will also keep an eye on that.

## Problem 1

There are 11 students in a class: 4 boys and 7 girls. We need to form a group of 5 people.

- (a) How many different groups can you make?
- (b) How many different groups are possible with at least 4 girls?
- (c) If you pick the group (uniformly) at random, what is the probability that there are at least 3 boys in the group?

## Problem 2: Words

- (a) How many 'words' of length 5 can you make using each letter of the alphabet at most once?
- (b) And how many if the order of the letters is irrelevant? (I.e., if we treat 'words' and 'sword' as the same word.)
- (c) And how many words can you make if you can use every letter as many times as you like?
- (d) In how many unique ways can the letters in the word 'error' be arranged?
- (e) Consider a word of  $n$  letters in which two letters occur more than once:  $p$  and  $q$  times respectively. How many unique 'words' of the same length can you make of the  $n$  letters?

## Problem 3: Books

You have 3 books on complexity theory, 2 on probability theory, and 1 novel.

- (a) In how many ways can the books be arranged?
- (b) And what if the books on complexity theory must be together but the other books can be arranged in any order?

## Problem 4: Poker hands

Calculate the probability of drawing each of these poker hands.

- (a) **Two-pair** Two cards have one rank, two cards have another rank, and the remaining card has a third rank. Example: two 2's, two 5's and a king.
- (b) **Three-of-a-kind** Three cards have one rank and the remaining two cards have two other ranks. Example: three 2's, a five and a king.