

**Advanced Statistical Physics (WS11/12)**  
**Problem sheet 1**

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### 1 Yahtzee

We want to consider a simplified version of the game of dice Yahtzee: 5 ideal dice are thrown at the same time only once. Calculate:

- The probability of a Yahtzee, which is all five dice showing the same face.
- The probability of a Full House, i. e. a three-of-a-kind and a pair.
- The probability of a Large Straight, which is five sequential dice (1-2-3-4-5 or 2-3-4-5-6).
- The probability of a Small Straight, i. e. four sequential dice (1-2-3-4 or 2-3-4-5 or 3-4-5-6).
- The probability of exactly one 1.
- The probability of at least one 1.

### 2 Random Walker

A drunken person starts in front of a lamp pole and can only take steps in two directions (right/left). All steps are of the same length and both direction probabilities are equal. Calculate:

- The probability of reaching the starting point after taking 10 steps.
- The probability of 10 steps in the same direction.

### 3 Newsreader

A newsreader makes on average one speaking mistake per show. Please use the Poisson-distribution and calculate:

- The probability of a show without mistakes.
- The probability of a show with exactly 5 mistakes.
- Why can we use the Poisson-distribution here? Which additional information is needed to use the Binomial-distribution?

### 4 Two Random Walkers

Two drunken persons walk independently as described in problem 2. Calculate:

- The probability of meeting at the starting point after taking 10 steps.
- b\*\*) The probability of meeting (anywhere) after taking 10 steps.