

MATH-57091 Probability and Statistics for High-School
Teachers.

Home Work 6, due on Monday October 15,

Instructor: Prof. Artem Zvavitch

Problem 1. *Suppose we know that the the average salary of a person living in Moscow is \$900 for the month of January, 2012.*

- *If we select a random person in Moscow, approximate the probability that his salary in January was over \$1500?*
- *If we also know that the variance of the January, 2012 salaries is \$100. Approximate the probability that that a randomly selected person from Moscow had a salary between 700 and 1100 dollars in January 2012?*

Problem 2. *Suppose that X is a random variable with mean 10 and variance 15 what can we say about $\mathbb{P}(5 < X < 15)$?*

Problem 3. *(Normal Approximation to the Binomial): let X be the number of times that a fair coin, flipped 40 times, lands heads. Find the probability that $X = 20$ (this is a Binomial distribution you had a very similar question last time). Next use the Central Limit Theorem to approximate $\mathbb{P}(X = 20)$. (Hint. Notice that $\mathbb{P}(X = 20) = \mathbb{P}(19.5 < X < 20.5)$).*

Problem 4. *The lifetime of a special type battery is a random variable with mean 40 hours and standard deviation 20 hours. Let X be a life time of a battery (A battery is used until failed!)*

- *Use Markovs inequality to estimate $\mathbb{P}(X \geq 80)$.*
- *Use Chebychevs inequality to estimate $\mathbb{P}(30 < X < 50)$.*

Assuming a stockpile of 25 such batteries the lifetimes of which are independent, approximate the probability that over 1100 hours of use can be obtained. (Hint: Use Central Limit Theorem).