

Mathematics 1550H – Probability I: Introduction to Probability

TRENT UNIVERSITY, Summer 2023 (S62)

Quiz #10

Counting Heads Again

Due just before midnight on Tuesday, 25 July.*

Instructions: Do all of the following problems. Please show all your work.

The discrete random variable X counts the number of heads that come up in 50 tosses of a fair coin.

1. Compute $P(23 \leq X \leq 27)$ as precisely as you can. [1]

NOTE: The solutions to Quiz #8 have an example of computing a probability for a binomial distribution using SageMath that you could modify to compute the one asked for here.

2. Use Chebyshev's Inequality to find a lower bound for $P(23 \leq X \leq 27)$. How close is this lower bound to the actual value? [1]
3. Use the standard normal distribution to approximate $P(23 \leq X \leq 27)$. How close is this approximation to the actual value? [2]
4. Toss an actual coin 50 times and record the sequence of heads and tails.
 - a. Give the sequence of heads and tails that you recorded. How many heads came up in the 50 tosses you made? [0.5]
 - b. Do you think the outcome of your 50 tosses support the hypothesis that the coin is more-or-less fair? [0.5]

NOTE: Yes, the marks in question 4 are ought to be gift marks. :-)

* You should submit your solutions via Blackboard's Assignments module, preferably as a single pdf. If this fails, you may submit your work to the instructor on paper or by email to sbilaniuk@trentu.ca.