Mathematics 1550H – Probability I: Introduction to Probability
TRENT UNIVERSITY, Summer 2023 (S62)

Quiz #3
Conditional Probability and Independence
Due just before midnight on Thursday, 29 June.*

Instructions: Do any *two* (2) of the following three problems. (If you do all three, only the first two encountered by the marker will get marked.) Please show all your work.

1. Suppose S is a sample space and A, B, and C are events in S, with $P(A) > 0$, $P(B) > 0$, and $P(C) > 0$, such that $P(A \cap B \cap C) = P(A) \cdot P(B) \cdot P(C)$. Does it follow that A and B are independent? *[2.5]*

NOTE: You should either explain – correctly! – why A and B must be independent, or give an example of a sample space S and events A, B, and C which meet the above conditions but for which A and B are dependent.

2. You are given 65 coins, 64 of which are fair and 1 of which has two heads. One coin is selected at random from the 65, and then tossed 6 times, coming up heads on every toss. What is the probability that the selected coin is the two-headed one? *[2.5]*

3. A box contains three different types of disposable flashlights. Suppose that 20% of the flashlights in the box are of type A, 30% are of type B, and 50% are of type C. The probabilities that type A, type B, and type C flashlights will last over 100 hours of use are respectively 0.70, 0.40, and 0.30.

a. What is the probability that a flashlight randomly chosen from the box will last over 100 hours of use? *[1]*

b. If a flashlight randomly chosen from the box lasted over 100 hours, what is the probability it was of type B? *[1.5]*

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* 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` .