MAT133

WRITTEN HOMEWORK 3 **Due: Sunday, June 18, 2023 at 11:59pm**

All solutions to be written in appropriate details. Please submit your solution to Crowdmark.

NOTE: *This version contain solutions to the problems. Solutions are not written in best details, so students are expected to fill in some of these gaps in their submissions.*

Question 1. (a) Once per minute, a subway train arrives at the XYZ station with probability p. Every time the train arrived, it is either Green, Red or Blue. Consecutive minutes are independent: for example, knowing that a train arrived or did not arrive at 10:12AM tells you nothing about what will happen at 10:13AM.

Trains arriving after 10:00AM always arrive in the following order: Green train always comes first, followed by the Red train, followed by the Blue train. Your train is the Blue Train.

You come to the XYZ station at exactly 10:00AM. What is the probability that you will wait exactly 10 minutes for your train?

Solution This is the example of so called Binomial distribution.

Starting from 10:01Am until 10:10AM, there are 10 possible times when the trains may arrive. Since we are interested in the situation when the wait time is exactly 10 minutes, we need to find the probability that the Blue train arrives at 10:10AM. In general, the probability that a train arrives at 10:10AM is p. But to make sure the train is Blue, we need the situation when the Green and Red trains arrived before 10:10AM, that is some time between 10:01AM and 10:09AM.