Quiz 1
Total marks = 100   Answer all questions

In all the questions, show detailed derivations.
Write down your name and your SID

Qn 1

Assume the expected age of a population is 80, what is the upper bound of the probability that a person lives to the age of (the last 3 digits of your SID)?   (10 marks)

Qn 2

Two dices are thrown. The first dice shows a "6". The difference of the two numbers is (0 if the last digit of your SID is even, 1 if it is odd). Are the two events independent?   (10 marks)

Qn 3

Let change the game rules of "Mark 6" to "Mark 5". There are 49 balls marked with numbers 1 to 49. Instead of 6 balls, let draw 5 balls and then a ball with the extra number, without replacement. When one buys a ticket, they put in 5 numbers. A prize is given if one obtains 2 correct numbers plus the extra number. What is the probability of obtaining this prize?
                                                                (10 marks)

Qn 4

Throwing two dice, one wins if one of the two numbers are consecutive, e.g. "1, 2" or "2, 1". How many times do you recommend, each time throwing two dice, such that one would win in the long run?
                                                                (10 marks)

Qn 5

i)   What is the expected number of different numbers if we throw a dice (the last two digits of your SID) times?

ii) What is the expected number of throws before all 6 numbers are thrown at least once?
                                                                (20 marks)

Qn 6

A testing method for COVID-19 virus has a false negative rate of 20% and a false positive rate of 3.125%.

Use the following data to estimate the probability that the population carries the virus: 32 confirmed to carry the virus in 1.78 million.

i) If a person tests positive, what is the probability that he actually carries the virus?

ii) If a person tests negative, what is the probability that he actually carries the virus?

<div align="right">(30 marks)</div>

Qn 7

Assume the distribution to be independent and identically distributed (i.i.d.). Let the event be that the sample mean deviates from the true mean by less than 0.1. Let the probability of this event occurring to larger than 0.99. Let the standard deviation be (2 if the last digit of your SID is odd, 4 if the last digit of your SID is even).

Calculate the number of samples required.

<div align="right">(10 marks)</div>