Practice Questions Sheet 3

This tutorial introduces discrete probability distributions (i.e., Bernoulli, Binomial, and Poisson distributions).

Student name: _____

Student number: _____

Please complete this assignment before the tutorial on the week of 16th November

Question 1

A multiple choice exam has 8 questions, with four choices given in each question. Suppose that a student hasn't studied and guesses the answers by choosing an answer at random.
If we say that X is the number of times the student answers the question correctly, where

$$X \sim Binomial(n = 8, p = 0.25)$$

then we can find probabilities and quantiles using the `dbinom()`, `pbinom()` and `qbinom()` functions.

1. Compute the probability that the student answers all questions correctly.
2. Compute the probability that the student answers all questions incorrectly.
3. Compute the probability that the student answers 2 or more correctly.
4. What is the 60th percentile for this distribution?
5. Suppose the student is able to eliminate one of the answers as incorrect and chooses randomly from the other three choices. What is the probability the student answers 2 or more questions correctly?

Question 2

Assume that users are expected to arrive at an ATM to withdraw cash at a rate of 2.5 every 30 minutes.

If we say that the random variable X, the number of people that use the ATM in a 30 minute interval has a Poisson distribution such that

$$X \sim Poisson(\lambda = 2.5)$$

We can find probabilities and quantiles using the `dpois()`, `ppois()` and `qpois()` functions.

1. Compute the probability that in a particular 30 minute interval, 1 person uses the machine.
2. Compute the probability that in a particular 30 minute interval, more than one person uses the machine.
3. Compute the probability that 3 or more people use the machine in an hour interval.
4. What is the 90th percentile value for the number of machine users in an hour interval?

Question 3

A fisherman catches, on average, 24 fish in a 4 hour time period. Let Y be a random variable denoting the number of fish caught per hour hour.

1. What is the $E(Y)$?
2. What is the probability that the fisherman catches exactly 5 fish in an hour?
3. What is the probability that the fisherman catches 7 or more fish in a 2 hour period?