**STU22004 – Lab 5 Instruction**

As discussed in lecture, a Normal distribution can be used to approximate probabilities for both Binomial and Poisson distributions.

For a Binomial distribution when is large and , we may use the following approximation:

where and .

For a Poisson distribution when is large (i.e. ), we may use the following approximation:

where and .

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Now, you are required to answer the following questions:

1. For a Binomial random variable with and , find the following probabilities using both and and compare them.

a.

b.

2. Generate 100,000 random samples from Binomial random variable with and , and by counting the samples which are equal 16 and 22, estimate the above probabilities empirically. You may use the following:

x <- rbinom(100000, n, p)

proba <- length(which(x == 16)) /length(x)

probb <- length(which(x == 22)) /length(x)

3. For a Poisson random variable with , find the following probabilities using both and and compare them.

a.

b.

4. Generate 100,000 random samples from Poisson random variable with , and by counting the samples which are equal 10 and 18, estimate the above probabilities empirically. You may use the following:

x <- rpois(100000, )

proba <- length(which(x == 10)) /length(x)

probb <- length(which(x == 18)) /length(x)