

# MTH 371: Assignment I

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September 7, 2023

## Instructions

- Use statistical software R or Python for your codes.
- Only basic built-in functions available in R/ Python are allowed.
- Due date is September 17, 2023 (11.59 p.m. IST). No late assignments will be accepted.
- Submit all of your work which include the codes, results, graphs and reports.

1. (10 points) Suppose a coin is tossed 20 times. We model the process as a Bernoulli process, so all the assumptions of Bernoulli process are satisfied. Answer the following questions

- (a) For  $p = 0.8$ , simulate the process 1000 times and show the corresponding histogram.
- (b) For  $p = 0.5$ , simulate the process 1000 times and show the corresponding histogram. Compare the output with the above part.

2. (15 points) Assume the patients arrive at a hospital's emergency room at a rate of 5 patients per hour. We are interested in studying the number of visitors in time interval  $(0, t]$  ( $t$  is considered to be continuous). Let us suppose we can model it as a Poisson process. Answer the following questions

- (a) Simulate the density of number of arrivals until time  $t$ . Provide the related graph(s). Verify the mean value of the number of arrivals in the process.
- (b) Simulate the density of number of arrivals until time  $t$  for  $\lambda = 15$  and compare the results with (a) (when  $\lambda = 5$ ).
- (c) Simulate the first inter-arrival time of the process. Provide the related graph(s).