1. Cars enter a car wash at an average rate of 4 per half hour.
   (a) Compute the probability that the 3 cars arrive in a half hour period.
   (b) Compute the probability that the 3 cars arrive in a 15 minute period.

2. Consider an $M/M/1$ system with arrivals $X_a \sim$ Poisson($\lambda_a = 3$ / minute) and service time
   $T_s \sim$ Exponential($\lambda_s = 4$ / minute). Calculate the following:
   (a) The expected time spent in the system.
   (b) The expected time spent in the queue component.
   (c) The expected number of individuals in the system.
   (d) The expected number of individuals in the queue component.
   (e) The utilisation factor.
   (f) The probability that an individual spends more than 2 minutes in the system.
   (g) The probability that less than 3 individuals exit the system in a 1 minute period.

3. Assume that potholes arise on a road at a rate of $\frac{1}{300}$ per metre according to a Poisson distribution. Calculate the following:
   (a) The probability that there are no potholes in 1km.
   (b) The probability that there are at least 15 potholes in 6km.
   (c) The probability that there are between 10 and 12 potholes in 3km.
   (d) The value of x such that x or more potholes in 3km is approximately 10%, i.e., $\Pr(X \geq x) \approx 0.1$.
   (e) The probability that the next pothole appears within 100 metres.
   (f) The probability that the next pothole is more than 1km away.
   (g) The probability that the next pothole is between 300 and 1200 metres from here. **(h)** The average distance between potholes and the corresponding standard deviation.

4. A life insurance salesman sells on the average 3 life insurance policies per week. Use Poisson's law to calculate the probability that in a given week he will sell
   (a) some policies
   (b) 2 or more policies but less than 5 policies.
   (c) Assuming that there are 5 working days per week, what is the probability that in a given day he will sell one policy?