

Practice Exam 2

1. What are the mean and variance of the Gamma distribution with parameters α and θ ?
2. Describe in three sentences or less the relationship between the Exponential distribution, Poisson distribution, and a Poisson process.
3. Let $X \sim N(1, 4)$. Construct a new random variable Z from X that is standard normal, $Z \sim N(0, 1)$.
4. Let X and Y be continuous random variables that are uniformly distributed on $[a, b]$ and $[2a, 2b]$ respectively, $0 < a < 1/2$ and $5 < b$. Which is greater $P(X = 2)$ or $P(Y = 2)$? Which is greater $P(X \leq 2)$ or $P(Y \leq 2)$?

5. Let $X \sim N(0, 1)$. Find $P(0.53 < X \leq 2.06)$ and $P(|X| < 1.96)$.

6. If the m.g.f. of X is $M(t) = e^{166t+200t^2}$, then find the mean and variance of X and $P(170 \leq X < 200)$.

7. The waiting times in minutes between successive calls to 911 between noon and midnight yesterday were

20	28	81	4	9	41	9	11	10	24	20
44	18	30	16	53	15	38	50	84	44	69

Suppose these calls are the result of sampling from a Gamma distribution with $\alpha = 2$ and $\theta = 120/7$. Compare the theoretical distribution mean and variance with the mean and variance of the sample. Compare $P(X < 35)$ with the proportion of times that are less than 35 minutes. Is the Gamma distribution a good model for this data?

8. A kid loves prizes at the bottom of cereal boxes and is trying to get all four prizes from his favorite cereal. The four different prizes are randomly put into the boxes at the factory. If his mom decides to buy the cereal until all four prizes are obtained, then what is the expected number of boxes she will have to buy until the boy has obtained all four prizes?
9. Let X have a Poisson distribution with variance $\sigma^2 = 3$. Find $P(X = 2)$.