

1. Let N be the number of goals scored in an upcoming soccer match between England and Wales, and suppose N is a Poisson variable with unknown parameter λ . We will model our uncertainty about λ using an exponential variable: $\lambda \sim \text{Expo}(1)$.
 - (a) Discuss why we might be interested in learning about λ . What does the value of λ tell you about the soccer match?
 - (b) What is the conditional expected value of N given $\lambda = \ell$?
 - (c) What is the unconditional expected value of N ?
 - (d) What is the hybrid joint distribution of N and λ ?
 - (e) What is the marginal distribution of N ?
 - (f) Before the match begins, what is the mean value of λ ?
 - (g) Suppose at the end of the game, a total of 2 goals were scored. What is the posterior distribution of λ ?
 - (h) What is the expected value of λ , given $N = 2$?