

# Individual HW03

Your Name Here

```
library(bayesrules) # R package for our textbook
library(tidyverse) # Collection of packages for tidying and plotting data
library(janitor) # Helper functions like tidy and tabyl
```

## 1 BR Exercise 5.1 a, d, f

For each situation below, tune an appropriate  $\text{Gamma}(s, r)$  prior model for  $\lambda$

- (a) The most common value of  $\lambda$  is 4, and the mean is 7.
- (b) The most common value of  $\lambda$  is 14, and the variance is 6.
- (c) The mean of  $\lambda$  is 22, and the variance is 3.

## 2 BR Exercise 5.7

Let  $\lambda$  be the average number of goals scored in a Women's World Cup game. We'll analyze  $\lambda$  by the following Gamma-Poisson model:

$$Y_i | \lambda \sim \text{Poisson}(\lambda)$$

$$\lambda \sim \text{Gamma}(1, 0.25)$$

- (a) Plot and summarize our prior understanding of  $\lambda$
- (b) Why is the Poisson model a reasonable choice for  $Y_i$ ?
- (c) The `wwc_2019_matches` data in the `{fivethirtyeight}` package includes the number of goals scored by the two teams in each 2019 Women's World Cup match. Define, plot, and discuss the total number of goals scored per game

```
library(fivethirtyeight)
data("wwc_2019_matches")
wwc_2019_matches <- wwc_2019_matches %>%
  mutate(total_goals = score1 + score2)
```

- (d) identify the posterior model of  $\lambda$  and verify your answer using `summarize_gamma_poisson()`
- (e) Plot the prior, likelihood, and posterior of  $\lambda$ . Describe the evolution in your understanding of  $\lambda$  from the prior to posterior.

### 3 BR Exercise 5.15

Below are kernels for Normal, Poisson, Gamma, Beta, and Binomial models. Identify the appropriate model with specific parameter values.

- (a)  $f(\theta) \propto 0.3^\theta 0.7^{16-\theta}$  for  $\theta \in \{0, 1, 2, \dots, 16\}$
- (b)  $f(\theta) \propto 1/\theta!$  for  $\theta \in \{0, 1, \dots, \infty\}$
- (c)  $f(\theta) \propto \theta^4 (1 - \theta)^7$  for  $\theta \in [0, 1]$
- (d)  $f(\theta) \propto e^{-\theta^2}$

**4 TBA Mon**

**5 TBA Mon**

**6 TBA Mon**

**7 TBA Wed**

**8 TBA Wed**