Your Name: _____

Names of people you worked with: _____

Instructions: Work on this problem in class with your group (if you are attending class synchronously) or out of class (hopefully with a person or two! if you are attending class asynchronously). The problem should be done on a piece of paper with a pencil or on some kind of tablet. The problem should **not** by typed up or done in LaTeX.

Work for a *maximum* of 15 minutes on the problem (regardless of what time you are working). *Do not* come back to the problem to "fix it up" or "finish it." Be sure to write down the names of the people you worked with during class (or outside of class).

Take a picture of your work and use a scanning app to create a pdf (or create a pdf directly from your tablet). Upload your work to Gradescope (via Sakai) within 24 hours of class.

Task:

Recall the tape example. Assume that you have not yet collected any data. The goal is to compare the frequentist and Bayesian **estimators** (not a comparison of estimates, but a comparison of estimators). Find

1. MSE_F for $\hat{\theta}$ (the answer should be a function of θ)

2. MSE_B for $\delta(\underline{X})$ (answer should be a function of X)

- Prior: Gamma(2, 10) (or (2, 1/10) depending on how you parametrize))

- Data likelihood: Poisson(θ)

- Posterior: Gamma $\left(\sum X_i + 2, \, n + 10 \right)$

$$
\begin{aligned}
\text{(frequentist estimator)} \quad \hat{\theta} &= \frac{\sum X_i}{n} \\
\text{(Bayesian estimator)} \quad \delta(\underline{X}) &= \frac{\sum X_i + 2}{n + 10}
\end{aligned}
$$