1. Recall the globe tossing model from the lecture. Compute and plot the grid approximate posterior distribution for each of the following sets of observations. In each case, assume a uniform prior for p, and use a grid of $n = 30$ points.
   (a) W, W, W
   (b) W, W, W, L
   (c) L, W, W, L, W, W, W
2. Now assume a prior for p that is equal to 0 when $p < 0.5$ and is a positive constant when $p > 0.5$. Again, compute and plot the grid approximate posterior distribution for each of the sets of observations in the problem above.
3. Suppose that the globe tossing data turned out to be 6 waters in 9 tosses (as in the lecture. Compute a grid approximate posterior for the binomial parameter p using $n = 1000$ points. Use the same flat prior as before. Then, draw 10,000 samples from the posterior and answer the following questions:
   (a) How much posterior probability lies below $p = 0.2$?
   (b) How much posterior probability lies below $p = 0.8$?
   (c) How much posterior probability lies between $p = 0.2$ and $p = 0.8$?
   (d) 20% of the posterior probability lies below which value of p?
   (e) 20% of the posterior probability lies above which value of p?
   (f) Which values of p contain the *narrowest* interval equal to 60% of the posterior probability?
4. Suppose the globe tossing data had turned out to be 8 waters in 15 tosses.
   (a) Construct a posterior distribution, using grid approximation with $n = 1000$ points. Use the same flat prior as before. Then, draw 10,000 samples from the posterior distribution, compute the posterior mode, and compute a 90% HPDI for p. Interpret what these values mean.
   (b) Construct a posterior predictive check for this model and data. That is, simulate the distribution of samples, averaging over the posterior uncertainty in p. What is the probability of observing 8 water in 15 tosses?
5. Repeat the previous problem, but now use a prior that is zero below $p = 0.5$ and a constant above $p = 0.5$. This prior corresponds to our *a priori* knowledge that a majority of the Earth's surface is water. Compare the answers to these two problems. How well does each compare to the true value of $p = 0.7$? What difference does a better prior make?