

STAT 3202: Homework 10

Autumn 2018, OSU

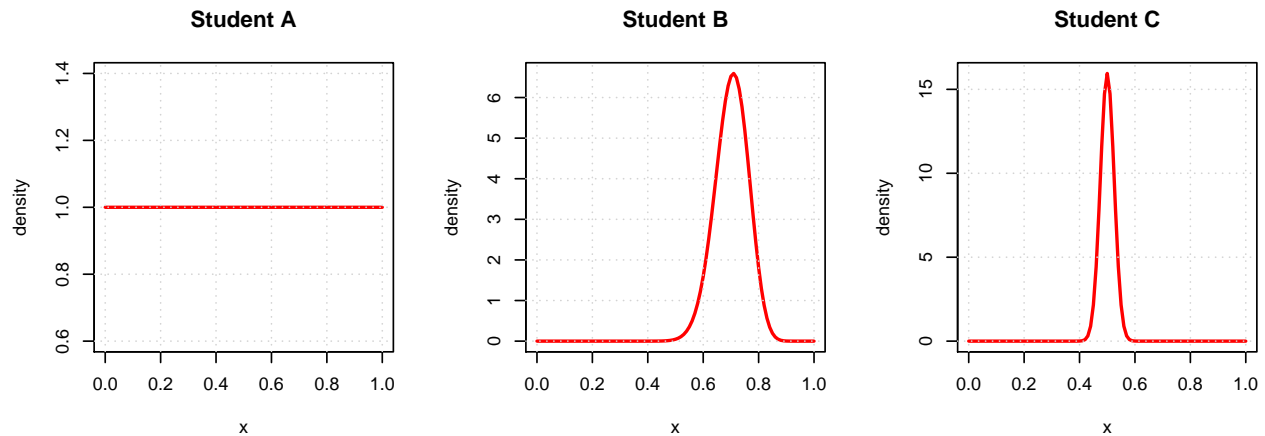
Due: Friday, November 30

Please see the **detailed homework policy document** for information about homework formatting, submission, and grading.

For this assignment we will be interested in θ , the pass completion percentage of **Dwayne Haskins**, the starting quarterback of The Ohio State Buckeyes.

At the beginning of the 2018 season three college students state their prior belief about θ .

- **Student A**, a student from UIUC, knows literally nothing about football and uses a *very* uninformative prior, a Beta distribution with $\alpha = 1$ and $\beta = 1$.
- **Student B** is a clever OSU fan and decides to use Haskins' 2017 statistics to inform their prior, thus they use a Beta distribution with $\alpha = 40$ and $\beta = 17$.
- **Student C** is a Michigan fan, and has a strong belief that Haskins has a completion percentage of 50%, thus uses a Beta distribution with $\alpha = 200$ and $\beta = 200$.



As of the writing of this assignment (before Saturday's game), Haskins has completed 294 of 424 passes during the 2018 season. Use this as the observed data. All three students will use a Bernoulli likelihood for this data when updating their beliefs.

Exercise 1

Use the above information to calculate an estimate of θ for each student. Call the estimates $\hat{\theta}_A$, $\hat{\theta}_B$, and $\hat{\theta}_C$. (Use the mean of the posterior distribution for each student as their estimator.) Hint: Recall the mean of a beta distribution.

Exercise 2

Calculate a 90% credible interval for θ from student A. Hint: `qbeta()` will be helpful. If you use R please supply the line(s) of code used.

Exercise 3

Calculate a 95% credible interval for θ from student B. Hint: `qbeta()` will be helpful. If you use R please supply the line(s) of code used.

Exercise 4

Calculate a 99% credible interval for θ from student C. Hint: `qbeta()` will be helpful. If you use R please supply the line(s) of code used.

Exercise 5

Assume you are Student B. Use your prior, and the observed data, to test $H_0 : \theta > 0.73$ vs $H_1 : \theta \leq 0.73$. Hint: `pbeta()` will be helpful. If you use R please supply the line(s) of code used.
