Bayesian Learning

Lab 1

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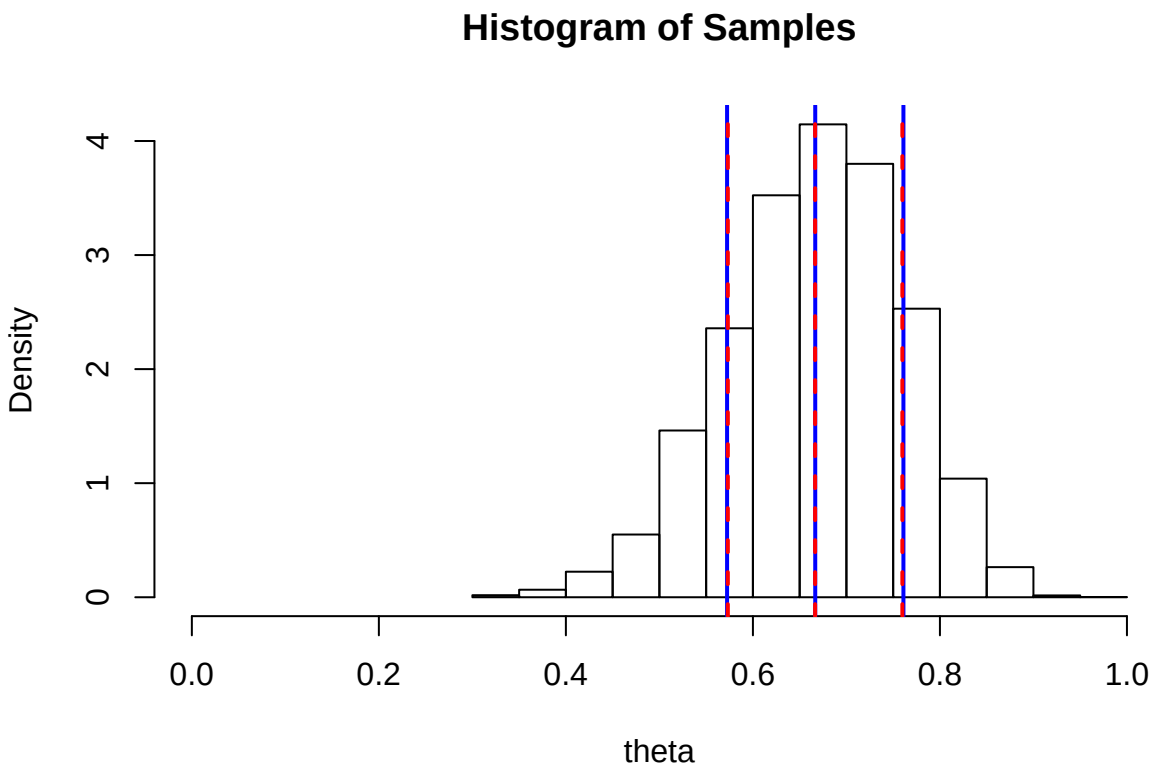
Question 1

```
n <- 20
s <- 14
f <- n - s

alpha_prior <- 2
beta_prior <- 2
```

a

```
drawSamples <- function(nDraws, alpha, beta) {
    rbeta(nDraws, shape1=alpha, shape2=beta)
}

nDraws <- 10000
alpha <- alpha_prior + s
beta <- beta_prior + f

samples <- drawSamples(nDraws, alpha, beta)

true_mean <- alpha / (alpha + beta)
estimated_mean <- mean(samples)

true_sd <- sqrt((alpha * beta) / ((alpha + beta)^2 * (alpha + beta + 1)))
estimated_sd <- sd(samples)
```

```
hist(samples, freq=FALSE, xlab="theta", main="Histogram of Samples", xlim=c(0, 1))

abline(v=true_mean, col="blue", lwd=2)
abline(v=true_mean + true_sd, col="blue", lwd=2)
abline(v=true_mean - true_sd, col="blue", lwd=2)

abline(v=estimated_mean, col="red", lwd=2, lty=2)
abline(v=estimated_mean + estimated_sd, col="red", lwd=2, lty=2)
abline(v=estimated_mean - estimated_sd, col="red", lwd=2, lty=2)
```



b

c

Question 2

a

b

c

Question 3

a

b