Question 1

b) The sample $\text{Cov}(\widehat{\beta_2}, \widehat{\beta_3})$ obtained from the data is 79841.45. The value of $\text{Cov}(\widehat{\beta_2}, \widehat{\beta_3})$ obtained from the distribution of $\hat{\beta}$ is 56968.07. Based on the question, due to the relatively large variance of the estimator of sample covariance, there may be some discrepancy between the theoretical and empirical results. We find that there is some discrepancy between 79841.45 and 56968.07. However, this occurs probably because of the relatively large variance of the estimator of sample covariance.

```
# b)
beta2hat <- beta[3,]
beta3hat <- beta[4,]
cov(beta2hat, beta3hat)
15000^2*XtXinv[3,4]
```