Homework # 5
Due: March 6, 2017

1. The 2,026 households in a city are divided up into four strata on the basis of declared income. Simple random samples of household are selected from within strata and the proportion of households renting the house they live is found by interview. The data obtained are given in the table below.

Stratum based on income (in 000's)	Stratum size	Sample size	Number renting
Under 50	1,190	40	30
50-100	523	35	18
100-200	215	35	7
Over 200	98	40	5

   (a) Assuming a binomial model within each stratum and a non-informative prior for the proportion, construct the posterior distribution of the proportion of renters in the city.
   (b) Construct the posterior distribution of the proportion of renters by ignoring the stratification (that is treat the entire sample as a simple random sample from the population of 2,026 households).
   (c) Compare the two posterior distributions and discuss the effect of ignoring the stratification.

2. A district contains 2.072 farms which have been divided into five strata on the basis of area in acres. Simple random samples of farms were taken and the number of cattle on each farm in the sample is determined. The stratum size, sample size, sample mean and variance are provided in the table below.

Stratum	Stratum Size	Sample size	Sample mean	Sample variance
Under 16	635	84	4.24	27.54
16-30	570	125	11.63	55.84
31-50	475	138	15.85	71.70
51-75	303	112	23.59	192.32
Over 75	89	41	29.61	334.93

(a) Construct the posterior distribution of the total number of cattle in the population and its 95% highest posterior density interval.

(b) When the stratification is ignored, the sample variance based on the total sample is 136.19. Construct the posterior distribution of the population total number of cattle assuming the data are from a simple random sample.

(c) Compare the two posterior distributions obtained in (a) and (b) and discuss the effect of ignoring the stratification.