**Mini-project 3 (due 4/4/2022 by 11:59PM).**

Problems 1 and 2 can be completed with a calculator or by hand, and answers posted either as a separate file, or as commented text as part of the .sas file.

For the SAS portions, follow the SAS program file submission guidelines to submit a single .sas file that completes the problems below. Answers to queries (such as “comment on the results” etc.) should be included as comments in the .sas file. Any requested output with images should be placed in a single Word or pdf file and uploaded as a separate file.

**Problem 1 (3 points)**

(2 points) Following the pizza example, suppose you now have a total 25 pizzas, of which 8 are pepperoni-only, 7 are green-pepper-only, 5 are pepperoni-and-green-pepper, and 5 are plain. Because the pepperoni and green peppers are distributed haphazardly, it is possible for a slice to be plain, even if the pizza itself is not plain. Assuming you choose a slice randomly from the pizza, the following are true:

1. P(plain slice|pepperoni-only pizza)=1/8
2. P(plain slice|green-pepper-only pizza)=1/4
3. P(plain slice|pepperoni-and-green-pepper pizza)=1/40
4. For a pizza slice drawn randomly from all possible pizzas, what is P(pepperoni-only pizza|plain slice)?
5. For a pizza slice drawn randomly from all possible pizzas, what is P(pepperoni-and-green-pepper pizza|plain slice)?
6. For a pizza slice drawn randomly from all possible pizzas, what is P(pizza contains green peppers|plain slice)?

**Problem 2 (1 points)**

For the weapons.txt file used in Quiz 7 (and also distributed with this mini-project), assume that the set of individuals represent a population from which we draw randomly. What are

1. P(an>40 and sex=F)?
2. P(an>40 | sex=F)?

**Problem 3 (1 points)**

This problem applies SAS to the weapons.txt dataset used in Quiz 7. Notice that this is a space delimited file (you'll need to use the DELIMITER statement along with DBMS = DLM).

Fit a Bayesian MLR model with uniform priors on the betas, response variable 'an' and three predictor variables: 'aw' , 'cxen', and the interaction between 'aw' and 'cxen'. For the last term, you can simply include ‘aw\*cxen' in the GENMOD code. Report the mean and 95% HPD for the beta coefficient for aw\*cxen.

**Problem 4 (3 points)**

On the moodle site for this mini-project, we have files weapons.txt, weapons1.txt and weapons2.txt. The latter two datasets are the result of splitting the observations from weapons.txt into two datasets. The purpose of this problem is to see what happens when we analyze the full dataset vs. sequential analysis of the two subsetted datasets. If weapons1.txt was the first dataset that we obtained, and weapons2.txt was the second dataset, we hope that we can find a way to analyze weapons2.txt in a way that somehow acknowledges what we have learned from weapons1.txt.

1. For the full dataset weapons.txt, fit a Bayesian MLR model with uniform priors on the betas, response variable 'an' and two predictor variables and 'aw' and 'cxen'. Report the posterior mean and 95% HPD for the beta coefficient for aw.
2. For the partial dataset weapons2.txt, fit a Bayesian MLR model with uniform priors on the betas, response variable 'an' and two predictor variables and 'aw' and 'cxen'. Report the posterior mean and 95% HPD for the beta coefficient for aw.
3. Fit the regression model for weapons1.txt with response variable 'an' and two predictor variables 'aw' and 'cxen' and use the approach in the notes to output the means and covariances for the betas.
4. Taking the output from c) to place normal priors on the betas, fit the Bayesian MLR model for weapons2.txt with response variable 'an' and two predictor variables 'aw' and 'cxen'. Report the posterior mean for the beta coefficient for aw and its 95% HPD. Contrast these values with the analogous values obtained from parts a) and b), and comment on whether the results are what you might have expected.