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CSC 6223 Assignment 2

1.
   a. k=2; records 1 and 4 are an anonymity set and records 2,3,5,6, and 7 are an anonymity set
   b. k=3; there are at least 3 male records 5,6,7 and three plus one female records 12,3,4.
   c. L=2 for Dataset 1 since each record has at least one other record that is the same. There is no l-Diversity for Dataset 2 since Fav. Show has unique variables that compromise the quasi-identifiers.

2.
   (P || Q) = .1* ln(.1/.4) + .2 * ln(.2/.3) + .3 * ln(.3/.3) + .4 * ln(.4/.1) = **0.33479528671**

3.
   Cost of 7k to 3k, 4k, 5k = 1/9*((7-3)+(7-4)+(7-5))/8
   Cost of 9k to 6k, 7k, 8k = 1/9*((9-6)+(9-7)+(9-8))/8
   Cost of 10k to 9k, 10k, 11k = 1/9*((10-9)+(10-10)+(11-10))/8

   So, 1/9*(15)/8 = **.2083**

4.

   Count query local sensitivity of D:

   Global value is three since there are 3 eights.

   There is a count of 2 for one and 2 for two. All other counts are 1.

   So the max count value being 3, we do 3-1 and 3-2 and take the max. This means the count query local sensitivity is **2**.

   Median query local sensitivity of D:

   $\mathrm{Med}(D) = x_m, m = (n+1)/2$
   n is 11 so 12/2 is 6. 6^{th} element in D is 6 $= x_m$

   $LS_f(D) = \max(x_m - x_{m-1}, x_{m+1} - x_m)$

   $= \max(6 - 4, 7 - 6)$

   $= \max(2,1)$

   $= \mathbf{2}$

5.

With differential privacy as

$$\frac{\Pr[A(D) \in S]}{\Pr[A(D') \in S]} \leq e^{\varepsilon}$$

We can substitute the values as

$$\frac{.3}{.6} \leq e^{\varepsilon}$$

And solve for ε. To be at least equal to .3, e^{ε} has to be at least episolon value **ln(.3)**. So our differential privacy protection level is about **-1.204**.

6.

Since $\frac{\Pr[A(D) \in S]}{\Pr[A(D') \in S]} \leq e^{\varepsilon}$ satisfies differential privacy.

The probability of yes answers is ¾ and the probability of no answers is ¼

.75/.25 is 3. So randomized response gives **ln(3)** differential privacy.

7.

For Nash Equilibrium, you must reach a state where you cannot play a move that will gain any probability of defeating the other player.

In rock, paper, scissors, the probability of a 2-player game is that both players have a 1/3 probability of each choice.

If we only play one round that means we have equivalent probability for all choices. One player cannot gain advantage by choosing another choice and gaining the probability to win higher than the other. The game of rock, paper, and scissors satisfies Nash equilibrium.