**Geographic Information Science Exercise 10 (Questions)**

**Spatial Analysis II:**

**Spatial Joins & Overlays**

These questions will require you to use the skills and information you learned in chapter 10, the tutorial, and the associated lectures.

This exercise will further your familiarity with Spatial Joins and Overlays in ArcGIS Pro.

Items to keep in mind:

1. Create a new project before beginning the exercise.
2. General location of data files will be provided (see below). You will have to determine exactly which file to use, but the folders you should be working with are identified.
3. Any questions requiring the acquisition of data online will be your responsibility to find the data and download it.
4. Any new tasks required will be described. Otherwise, the tools and techniques required to answer the questions will have been introduced in the tutorials for this lab and any prior labs.

**\*\*\*NOTE:** Whenever working with projecting GIS data **ALWAYS** make a copy of the file you are projecting (in case you make a mistake and have to redo the process)

To answer the questions, you will need to use the data in the following folders:

**mgisdata\Austin\Austin geodatabase**

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**Use Spatial Joins to answer the following questions:**

**Question 1:** A tennis club is implementing an after-school tennis program. Use a spatial join to determine the closest tennis court to each school. What is the average and median distance of schools to tennis courts, in miles? Create a histogram of distances (in miles). **Capture** your histogram and insert it here.

**Average Distance:**

**Median Distance:**

**Question 2:** A study is being done to evaluate staffing levels in the police districts. Determine the number of people (using the *blockpop* point feature class) living in each district. Calculate the minimum, maximum and median population for each district. Map and chart (histogram) the results (population per district). **Capture** your map (choropleth – 5 classes) and histogram (10 bins) and insert it here. Propose an explanation as to why some of the districts have such low populations compared to other districts (**HINT:** compare the *blockpop* points to a basemap).

**Min. Pop:**

**Max. Pop:**

**Median Pop:**

**Question 3:** The University of Texas at Austin received a grant for water quality education. Each school will study aspects of the watershed in which it is located. Create a list of schools, each with its designated watershed. Sort the list alphabetically by school name. **Capture** the results (attribute table) for the first 10 schools, with the grade range and watershed name visible and insert here.

Which watershed has the most schools, and how many does it have?

**Watershed:**

**Number of schools:**

**Question 4:** A runner’s club is analyzing access to parks in Austin. The assumption is that runners will go to the *closest park* and not run to parks more than *one mile away*. Determine the potential usage at each park based on the block population closer to that park than any other, but not more than 1 mile away. (**HINT:** determine the population per park) (**HINT**: Don’t double count population). **Create** a map showing the parks in Austin with a symbology displaying the parks in 5 classes based upon potential runners (total population). **Capture** your map (with Table of Contents showing population classes) and insert here.

Which Park has the most potential runners and least potential runners?

**Most runners (park name and population):**

**Least runners (park name and potential runners):**

**Question 5:** Determine the number of wells situated within each census tract in Austin. **Create** a map showing the number of wells per 1000 people (5 classes). **Create** a map showing the mean well depth per census tract (5 classes). **Capture** each map and insert here (be sure that each map contains a title and legend)

**Use Map Overlays to answer the following questions:**

**Question 6:** Septic systems are commonly used in low-density housing areas, but the impacts on aquifers may be of concern. Map the areas of Austin where the census tract population densities are less than 1000 people per square mile and where the geologic unit names contain *Limestone* or *Terrace* or *alluvium*. **Capture** your map and insert it here.

**Question 7:** The frequency of street repairs are influenced by several factors, including the clay fraction of soils and road usage. How many street miles in Austin have more than 50% clay in their soils and a road class of 5 or less? **Capture** a map showing these roads and insert it here (be sure to include the topographic basemap for reference).

**Total miles:**

**Question 8:** Water quality and risks of gasoline spills may be affected by the prevalence of road arteries in a watershed. Using the *arteries* feature class, determine the number of road miles in each watershed. Which three watersheds have the highest arteries mileage? **Create** a map showing all the watersheds, classified based upon arteries mileage. **Capture** the map (with the classification visible) and insert it here.

**List top three watersheds and their arteries mileage:**

**Question 9:** Perhaps the total street miles is a better mileage than the arteries. Repeat the watershed analysis using the *streets* feature class and compare the results. List the three watersheds with the highest street mileage. **Create** a map showing all the watersheds, classified based upon street mileage. **Capture** the map (with the classification visible) and insert it here. Compare this map with the one for question 8. What significant issue impacts the quality of this map (question 9)? (**HINT:** Look at the different datasets (layers)).

**List top three watersheds and their street mileage:**

**Question 10:** The impact on flooding on Austin would depend on the flood frequency and the density of the population. Use the *tracts* and *soils* feature classes to calculate a flood impact index based on the population density times the flood frequency (*AFLDFREQ* field), scaled from 1-10. **Create** a map showing census tracts classified according to the Flood Impact Index (1-10). **Capture** your map (including the classification categories) and insert it here. What aspect of the input data most limits the applicability of this map?

**Deliverables:**

* This answer sheet
* Images inserted for the following questions:
  + Question 1 (histogram)
  + Question 2 (map and histogram)
  + Question 3: (attribute table)
  + Question 4: (map)
  + Question 5: (2 maps)
  + Question 6: (map)
  + Question 7: (map)
  + Question 8: (map)
  + Question 9: (map)
  + Question 10: (map)