**Geographic Information Science Exercise 4**

**Coordinate Systems**

These questions will require you to use the skills and information you learned in chapter 4, tutorial 5 and the associated lectures.

This exercise will further your familiarity with coordinate systems in ArcGIS.

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**

**mgisdata\Oregon**

**mgisdata\Usa**

**mgisdata\World**

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**Reading question 1:** What is the difference between a projection and a coordinate system?

**Reading question 2:** What is the difference between a central meridian and the prime meridian?

**Reading question 3:** What does the Reference Latitude refer to?

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**Question 1:** Examine the coordinate system for the *streets* feature class in the *Austin* geodatabase. What is the name of the coordinate system? Is it projected or unprojected? If projected, what is the projection? What are the map units?

**Coordinate System:**

**Projected/Unprojected:**

**Projection name:**

**Map units:**

**Question 2:** What is the name of the projection (not the coordinate system) used by the feature classes in the *Oregondata* geodatabase? What are the central meridian and the standard parallel(s)? Does it use the equator for the latitude of origin? If not, what is the latitude of origin?

**Projection:**

**Central Meridian:**

**Standard Parallel(s):**

**Latitude of Origin:**

**Question 3:** Determine the coordinates of the summit of Mount Rainier, Washington in (a) degrees-minutes-seconds, (b) UTM Zone 10 (in meters), and (c) Washington State Plane South (in US feet). Use the NAD1983 datum in all cases.

**Degrees-minutes-seconds:**

**UTM Zone 10 (m):**

**Washington State Plane South (ft):**

**Question 4:** What datum is used for the Africa Lambert Conformal Conic coordinate system? What datum is used for the North American Equidistant coordinate system? Why do they use different datums?

**Africa Lambert:**

**North America:**

**Question 5:** Create a new map. Examine the locations below and choose a good projection/Coordinate system from the predefined coordinate systems in ArcPro for maps of the following areas. Briefly explain your choice for each

**HINT:** if you do not know where a location is, Google it!

**HINT:** Start with the State Plane zone (*spczn83*) and the UTM zone (*utmzone.shp*) feature classes first (They may not be suitable for all locations). Then explore other Projection/Coordinate systems if needed.

**Remember,** that a good system should minimize the distortion as much as possible across the area of interest (ie. area of interest should not be too far from the central meridian). And the entire area should be contained within the projection (ie. don’t cross state plane zones, etc.)

**Humboldt County, CA =**

**Grafton County, NH =**

**State of Nevada =**

**State of New Jersey =**

**England =**

**Mumbai, India =**

**Antarctica (true distances required) =**

**Question 6:** You are working on a statewide Wyoming project and decide to define a custom coordinate system. Start with one of the **State Plane** zones for Wyoming, and modify it slightly to make it better for the whole state. Explain your approach and **Capture** (screen capture) the window showing the custom coordinate system description (**NOT** the map!) you created. Insert your image here.

**NOTE:** Give your new coordinate system a new name.

**NOTE:** Identify what you changed from the initial coordinate system to create your custom system.

**Question 7:** The *Austin* folder contains two shapefiles showing dog off-leash areas in Austin as points (*dog\_offleash\_areas.shp*) and polygons (*dog\_offleash\_bnds\_shp*). Both shapefiles show the same locations (dog parks), and both are within the city of Austin. Both files have unknown coordinate systems problems (they are different problems) when you add them to the map. Describe the problem for each; then fix them and create a map showing both the points and polygons with a backdrop of the major transportation arteries in Austin.

* **NOTE:** Make a copy of the two dog park files and work on the copies. It is easy to mess up coordinate systems and difficult to return them to their original settings. This way if you mess up the file you can go back to the original file and try again.
* **NOTE:** YOU can assume that since the data was collected for the city of Austin, that the dog park locations are correctly mapped, they just have problems with their coordinate system.
* **HINT:** Start with a blank map and load the *arteries* feature class **first** to set the coordinate system for the data frame. Then add the offleash data sets to compare them to the arteries feature class.
* **HINT:** Remember to look at the extent units and values and also to use the Zoom to Layer tool when solving the issue.
* Take a screen **capture** of your map (zoomed to the extent of the parks) and insert it here. Be sure to include the table of contents with your image.

**Deliverables**:

* This answer sheet.
* Screen captures (insert into answer sheet)
  + **Question 6** (coordinate system)
  + **Question 7** (map display)