

# ArcGIS

## Lab 1: Create a GIS Database

### OVERVIEW: The Analytical Process

Lab exercises that we undertake will follow a structured problem-solving approach:

1. **Issue:** understand the issue to be resolved (e.g. create a GIS database from scratch)
2. **Learning Objectives:** understand the learning objectives (i.e. typically understand the generic GIS tools used to solve the issue and gain some proficiency with the software)
3. **Data:** know what data you need and understand what you have:
  - a. assemble the data
    - i. create (or open an existing) map document (\*.mxd)
    - ii. ensure all the map layers are present
    - iii. create missing map layers if needed
  - b. explore the data (i.e. understand what you have)
  - c. alter symbology to make it more readily understandable
4. **Analysis:**
  - a. determine the analyses required (i.e. make a plan what needs to be done)
  - b. conduct the analyses (i.e. execute the plan)
5. **Interpret Results:** be sure you understand all new map data that you create – if it doesn't make sense then stop and think (and possibly redo that step)
6. **Communicate Results:** make a map layout that clearly communicates your results.

---

### The Issue

No real issue to be resolved for this lab. Instead we are simply creating a GIS database using data we collected.

---

### Lab Objectives:

By the end of this lab, you will be able to:

- 1) Create a GIS database in ArcGIS
  - 2) Create map layers and use exact digitizing (snapping) techniques to digitize features
  - 3) Enter attribute data into the data table
  - 4) Check the operability of your data by performing queries
-

## Background

This exercise emphasizes the data collection and entry phase of a GIS project. Before you begin to collect data, you must have a clear understanding of the end product; in this exercise, you must design your database so that the end product provides you with the capability to query the attribute data based on selected fields of interest (e.g. colour, value, make/ model of vehicles)

### Data Collection Procedure – as previously assigned:

- For data collection you can work in pairs. However, the GIS lab portion will be done individually.
- Select a section of 20 stalls in the Parking Lot on campus. For each parking space, record 6 attribute values in tabular format on a piece of paper. You will record **license plate number** and estimated dollar **value** for each vehicle, in addition you need to collect at least 4 other attributes, such as make, model, colour, # of doors, truck/car, etc.
- You must record the license plate numbers consistently — either with or without a space between the numbers and the letters. If there is no car in a parking space, record the letter A for the first empty parking space, the letter B for the second empty space, and so on.
- Make certain you have a clear idea of the type of questions that a user of your data may wish to ask about the parked cars as you are given only one opportunity to design your database and collect your data.
- Make copies of the data that you have recorded so that each student has their own copy. Be sure to bring this data to the computer lab so that you can enter it into the GIS.

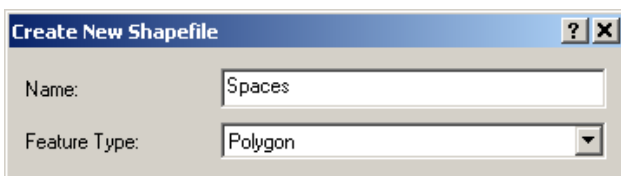
## Data Entry Procedure

1. You should already have copied the **Lab1** folder from the course folder on the G:\ drive to your **U:\frst\_328** folder. If not, do so now.
2. Start ArcMap and open the existing map document **U:\frst\_328\Lab1\Parking\_Lot\_Image**.  
\*\* you may need to first *Connect to Folder* so that ArcMap will recognize your folder.
3. Using Save.As, re-save the map document in your **Lab1** folder and name it *My\_Parking\_Lot*.

*You copied a map document (Parking\_Lot\_Image.mxd) from the G: drive to your U: drive BUT you did not copy any data layers. Check out the source of the TIF image (right-click and select Properties) – it is on the G: drive. Note it is rather large – that is why you did not actually copy the image itself to your U: drive.*

*What is the “coordinate system” (datum and projection) of the data frame? Later you will be creating a data layer and it is best if you create it with the same coordinate system as your data frame.*

4. Rename the Data Frame from “**Layers**” to “**Lot – J1 East**”
5. Start ArcCatalog and navigate to your working directory (U:\frst\_328\Lab1) \*\* you may need to first *Connect to Folder* so that ArcCatalog will recognize your folder.
6. Right-click on your working directory (i.e. Lab 1) and create a new shapefile. Name it **Spaces** and select **polygon** for the feature type.



*Next, you will want to set the coordinate system of this new layer to be the same as your existing data frame.*

Click on the *Edit* button and then click on the *Select* button from Spatial Reference Properties dialog box.

On the next window double click to select the *Projected Coordinate Systems*, then continue until you find the same coordinate system as the data frame.

When the projection details are displayed on the Spatial Reference Properties dialog box, click *OK* and then click *OK* again.

7. Add the **Spaces** layer to ArcMap. Make sure that the Spaces layer appears above the image layer in the Table of Contents.

8. In ArcMap, zoom-in around your twenty parking spaces in map view.
9. Digitize your polygons (parking stalls): using the Editor toolbar begin an editing session. If you can't see the Editor toolbar, select *Customize | Toolbars* and enable the *Editor* toolbar. You may wish to dock the toolbar on the top menu area.

- a) Click the *Editor* drop down arrow and select "Start Editing".
- b) The *Create Feature* toolbox opens. Click once on "Spaces. Note the construction tool selected (at the bottom of the toolbox) is Polygon – this is what we want.
- c) Move the cursor to a corner of one of your parking stalls you wish to digitize; click once; move to the next corner and click once, move to the third corner and click once; and finally move to the fourth corner and double-click.

**NOTE**—It is alright if the polygons representing the parking spaces are not "perfect rectangles".

- d) On the *Editor* toolbar, select *Editor | Save Edits* to save your work.

The remaining parking spaces need to be digitized as being "exactly adjacent" to each other. In order to do this, you will turn on a drafting assist called *snapping*.

- e) On the *Editor* toolbar, select *Editor | Snapping | Snapping Toolbar*. We only want the *Vertex Snapping* option enabled, so toggle the other 3 options off.
- f) Move the cursor back to the map area and hover over one of the corners – note when you get close to a corner, a "box" appears indicating that you can snap to this point - click once to start the adjacent polygon. Move to the next adjacent corner and click once; then finish the polygon as before – remember to double-click for the 4<sup>th</sup> coordinate.

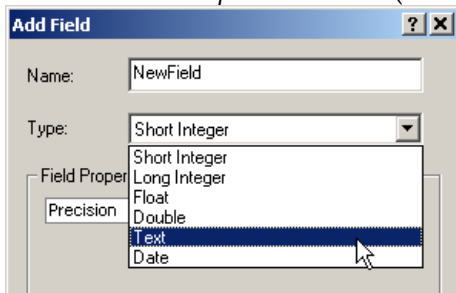
\*\* If, after double-clicking your polygon "looks wrong", press Ctrl-Z to undo.

- g) Digitize the rest of your polygons.
- h) On the *Editor* toolbar, select *Editor | Stop Editing*, and save your edits

10. Open the attribute table for your **Spaces** layer:

Note that all entries in the Shape\* field are "Polygon" – the actual coordinates for each polygon are stored in a separate table elsewhere. The FID (feature ID) column is maintained by ArcGIS – you cannot edit these entries. However, the ID column is the place where you can enter data. We'll enter data in this column a little later. First we'll create columns for the data you collected.

11. Create new fields to correspond to the data categories you collected in the field.
- a. Click the *Table Options* button (at the top-left of the attribute table), select *Add Field...*



- b. The name should be short and self explanatory (and contain **no spaces**). The data type will depend upon the type of data collected. Data types include:

<b>Text</b>	Letters or mixed letters and numbers.
<b>Short Integer</b>	Numbers with no decimal component, like -1, 0, 1 ... 100, etc. It is limited to 4 digits (i.e. 1234)
<b>Long Integer</b>	Numbers with no decimal component, like -1, 0, 1 ... 100, etc. It is limited to 9 digits (i.e. 123456789)
<b>Float</b>	Numbers with a decimal component, like -100.23, 1.2235, etc.
<b>Date</b>	Dates, which may or may not include components for month, day, year, and time of day.

Set the length for any Text fields that you create to something appropriate (instead of the default 50). You may accept the default values for any other field types.

Create a field for each category of data you collected.

12. Record the field definitions on your GIS Lab1 Submission sheet (attached).
13. Enter the data into the attributes table. Note, you will have to click “Start Editing” again from the Editor toolbar. Be sure the ID field has entries from 1 – 20.
14. Label the Spaces map layer using the ID field.
15. Save your work.

## Check the Operability of Your Data

1. Use the *Identify* tool to click on the different parking stalls. Do they match the values you entered?
2. Query the attribute data for ID values greater than 9. Note this query expression ("Id" >9) has already been entered in the Queries Table on your submission sheet.
3. Convert the query results (selection) to a separate map layer.
  - a. Right-click on the **Spaces** layer and select *Data | Export Data*.
  - b. Ensure that the proper folder is selected (U:\FRST\_328\Lab1) and name the file **Query1.shp**. When prompted be sure to add the new layer to the map.
4. Perform two other queries of your choosing; save and name them in sequence. Be sure to enter the layer name and expression in the Queries Table.
5. The fourth and final query should be for value > \$7,000. Be sure to enter this data in the Queries Table as well.
5. Create a JPEG file of you last query.
  - o Ensure that Image layer is on the very bottom, the Spaces layer is above the Image layer and that your last query layer is displayed above the Spaces layer. These should be the only layers turned on for display.
  - o Click File, then Export Map, browse to your working folder and save as a jpeg. Name the file as *Name\_Lab1.jpg* (e.g. Corrin\_Lab1.jpg).
6. Create a *Layer Package* that you will email to your instructor. Right-click on **Spaces** and **save as a layer file**. Be sure you are saving in the **Lab1** folder and name the file with your last name (i.e. Corrin.lpk) and then click *Validate* and then *Share*.
7. Save your map document again.
8. Hand in the GIS Lab1 Submission Sheet.
9. Email your JPEG and layer package to [doug.corrin@viu.ca](mailto:doug.corrin@viu.ca)

**GIS Lab1 Submission:**

Name: \_\_\_\_\_

**Field Definitions Table**

Name	Type	Precision / Length*
id	long integer	default

\*enter “default” for numeric type fields, but enter your custom value for text fields

**Attribute Data Table**- Supply a neat copy of your data, **OR** fill-in the table below

Stall No.	Field 1: License_PL	Field 2: Value	Field 3:	Field 4:	Field 5:	Field 6:
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

**Queries Table**

Layer Name	Expression
Query1	“Id” >9