

Discrete Math - Logic

Before you begin using this module, you will need to know about using a Web-based GIS viewer. You can do this by watching the tutorial video or working through the tutorial. The tutorial video, student activity, and Web-based GIS Tutorial Viewer can be found at <http://gis.lanecc.edu> → “Modules” tab → “Tutorial” link. The activity works best with a high speed Internet connection.

Prior Skills: For this activity, you will need to know how to turn on and off layers, make layers active and visible, use the zoom tool, toggle between the legend menu and the layers menu, and use the ID tool.

Objectives:

- Use logical connectors in searching a database.
- Understand how quickly the search narrows by adding connectors.
- Translate a search in to logic notation.
- Translate a search to a digital circuit.
- Break a story into logical statements to arrive at a solution.

- Open the Web-based map Called ancestry and Identity. It can be found at <http://arcgis.lanecc.edu/website/ancestry>

This map shows county-level data from the 2000 U.S. census for participant’s ancestry information. This category of census data is related to people self identification of their ancestry. The data shows number of people with a specific ancestry identity per 1000 population. This is normalized data. The lines that indicate county borders were not use in making this map because in many areas in the eastern US. The counties are so small including the lines would obscure the data values.

- Turn off the inset map 
- Toggle to the legend  and review the value ranges for Native American ancestry.
- Toggle back to the layers menu.

1. The “Toggle” operation is an example of which of the following: (circle one)

\vee , \wedge , \sim

Explain:

Native American ancestry is **Visible**, Make it **Active** and **Refresh** the Map.

- Use the Identity tool  and click on the county area in Montana which has the highest value (darkest brown)
- If you can’t find Montana you will need to make States **Visible** and **Active** and **Refresh** the map then use the find tool . Once you know were Montana is, you will go back two steps.

2. Record the following data values for the county that has the highest population.

Name _____ (County)
 Pop_2000 _____
 Med- Income _____
 K_NA_AN _____ (Native American ancestry per 1,000 populations)

- Click the Query tool 
- Using the drop down menu for field, choose POP_2000
- Choose Operator \geq
- Type 11696 in the value window.
- Click Add to Query String \rightarrow Execute
- Scroll down until you find the city you named above. Hit "More Records" several times.



3. This county is in record # _____

- Erase the first Query 

Let $P \equiv \text{POP_2000} \geq 11696$ & $Q \equiv \text{Med_Income} \geq 38779$.

- Set up a new Query to find the records for $P \wedge Q$.
- Locate your county on the list.

4. It is in record # _____.

Now let $N \equiv \text{K_NA_AN} \geq 448$.

5. We want to enter $P \wedge Q \wedge N$ into the Query. Do we need parenthesis? Yes or No

- Prove your answer to 5 by using a Truth Table

P	Q	N				

- Enter $P \wedge Q \wedge N$ into the Query and Execute.

6. What record is your county in now? _____

7. Draw the digital circuit representation of this final query in the space below.

8. You make a good friend in college and plan to stay in touch after you both graduate. You each have ideas about where you'd like to live. You would like to stay in the Northwest and live in Oregon or Washington. Your friend would simply like to stay in the 48 contiguous US states. You like the size of Eugene and would like to live in a county that had a population less than 250,000 but you want a lot of educated women living there. Your friend is looking to make some money and assumes their best bet is to move to a larger county, greater than 2,000,000 people. They also want to make more than \$65,000 a year and figure an area with that amount as the median income would be their best chance. They do have limits and are very clear that they will not live in California.

Write Boolean expressions for each of these searches and translate these to digital circuits below.

You: (note: parentheses are important here)

Your friend:

Execute these expressions in the Ancestry and Identity module.

What county and state would you live in if you picked the one that had the most women with PhD's?

What county and state would your friend live in if they wanted to have the highest French population?

How often will you visit your friend?